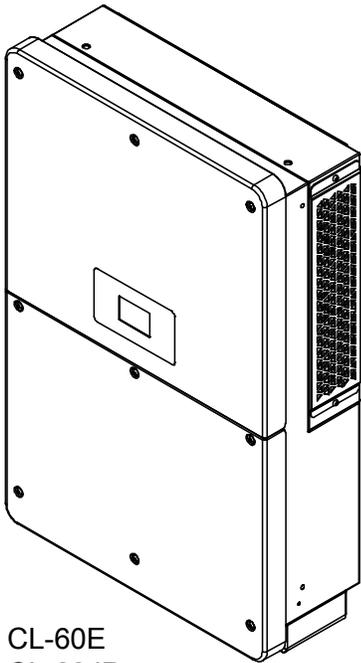


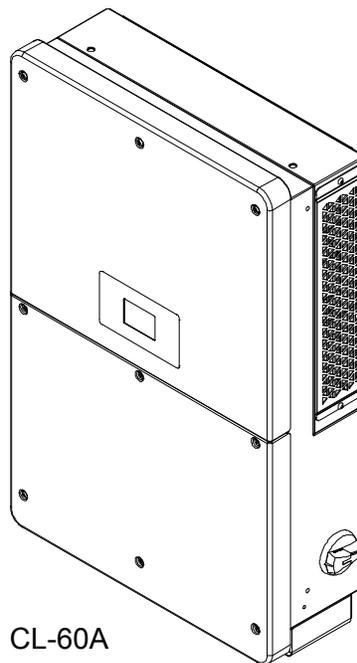
# Conext™ CL-60 PV Inverter

## Owner's Guide

975-0768-01-01 Rev G  
12-2017



CL-60E  
CL-60JP



CL-60A



# Conext™ CL-60 PV Inverter

## Owner's Guide

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**Contact Information:** <http://solar.schneider-electric.com>

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# About This Guide

## **Purpose**

The purpose of this Owner's Guide is to explain the procedures for operating, configuring, maintaining, and troubleshooting the Conext CL-60 PV Inverter.

## **Scope**

The Guide provides safety guidelines and general information for installing and operating the Conext CL-60, as well as information about configuring, monitoring, and troubleshooting the unit. It does not include information on how to use other Schneider Electric and third-party products.

## **Audience**

The Guide is intended for use by anyone who plans to design, construct, install, or operate a system involving the CL-60. The installation information in this guide is intended for qualified personnel. Qualified personnel have training, knowledge, and experience in:

- Installing electrical equipment and PV power systems (up to 1000 volts)
- Applying all applicable installation codes
- Analyzing and reducing the hazards involved in performing electrical work
- Selecting and using Personal Protective Equipment (PPE)

## Organization

This Guide is organized into:

Chapter 1, "Introduction"

Chapter 2, "Installation"

Chapter 3, "Electrical Connections"

Chapter 4, "Commissioning"

Chapter 5, "LCD Display Operation"

Chapter 6, "Troubleshooting"

Chapter 7, "Disconnecting, Dismantling, and Disposing the CL-60"

Chapter 8, "Specifications"

## Abbreviations and Acronyms

<b>AFD</b>	Arc Fault Detection device
<b>EMI</b>	Electromagnetic Interference
<b>G</b>	Ground (also referred as Protective Earth)
<b>GND</b>	
<b>HMI</b>	Human-Machine Interface
<b>IGBT</b>	Insulated Gate Bipolar Transistor
<b>LAN / WAN</b>	Local Area Network / Wide Area Network
<b>LCD</b>	Liquid Crystal Display (used for HMI displays)
<b>LED</b>	Light Emitting Diode (used for indicator lights)
<b>NFPA</b>	National Fire Protection Association
<b>PE</b>	Protective Earth (also referred as Ground)
<b>PPE</b>	Personal Protective Equipment
<b>PV</b>	Photovoltaic (or Solar)
<b>SPD</b>	Surge Protection Device

## Related Information

You can find more information about Schneider Electric, as well as its products and services at <http://solar.schneider-electric.com>.

# Important Safety Instructions

## READ AND SAVE THESE INSTRUCTIONS - DO NOT DISCARD

This document contains important safety instructions that must be followed during installation procedures (if applicable). **Read and keep this Owner's Guide for future reference.**

Read these instructions carefully and look at the equipment (if applicable) to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

### **WARNING**

WARNING indicates a potentially hazardous situation, which, if not avoided, can result in death or serious injury.

### **CAUTION**

CAUTION indicates a potentially hazardous situation, which, if not avoided, can result in moderate or minor injury.

### **NOTICE**

NOTICE indicates important information that you need to read carefully.

## Please Note

Electrical equipment must be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

## Safety Information

- 1. Before using this product, read all instructions and cautionary markings on the unit and all appropriate sections of this manual.**
2. Use of accessories not recommended or sold by the manufacturer may result in a risk of fire, electric shock, or injury to persons.
3. The manufacturer recommends that all wiring be done by a certified technician or electrician to ensure adherence to the local and national electrical codes applicable in your jurisdiction.
4. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the equipment with damaged or substandard wiring.
5. Do not operate the equipment if it has been damaged in any way.
6. Do not disassemble the Conext CL-60 except where noted for connecting wiring and cabling. See your warranty for instructions on obtaining service. Attempting to service the unit yourself may result in a risk of electrical shock or fire.
7. To reduce the risk of electrical shock, disconnect the power supply from the equipment before attempting installation, and any maintenance (including cleaning or working on any components connected to the equipment). Internal capacitors remain charged for ten minutes after all power is disconnected.
8. The equipment must be grounded. Use the protective grounding conductor provided with the AC input conductors.
9. This product is designed for outdoor use and is rated IP65 and Type 4X.
10. To reduce the chance of short-circuits, always use insulated tools when installing or working with this equipment. Do not leave tools inside.
11. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with electrical equipment.
12. Do not open nor disassemble the top half of the unit. There are no user-serviceable parts inside.
13. To disconnect the unit from DC power, turn the DC switch to OFF and then remove all PV string connectors from the DC terminals.

**⚠⚠ DANGER****ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARDS**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.

**Failure to follow these instructions will result in death or serious injury.**

Access to live parts shall be limited to suitably qualified electrical personnel. See installation instructions before connecting to the supply.

**NOTICE****EQUIPMENT DAMAGE**

- All cables connected to the CL-60 must run through the cable glands on the unit.
- This unit is susceptible to damage from EMI and nearby lightning strikes unless a surge protection device (a lightning arrester) is installed.
- Turn Off all devices before connecting cables.
- Use the CL-60's DC switch as its On/Off switch.
- To isolate the CL-60, follow "Lock-Out Tag-Out (LOTO) Procedure" on page xi.

**Failure to follow these instructions can damage equipment or affect network performance.**

## Storage Information

Store the inverter properly when the inverter is not to be installed immediately.

1. Inverter must be packed inside its original carton with the desiccant bags inside.
2. Store the inverter with its front panel facing up. The carton should lay flat and parallel to the ground.
3. Seal the carton with standard packaging tape.
4. Store the inverter in a dry and clean place to protect it against dust and moisture.
5. Temperature: -30 to 85 °C (-22 to 185 °F)  
Relative humidity: 0 to 100%.
6. Do not stack more than two inverters on top of another.
7. Keep the inverter away from chemically corrosive materials.
8. Periodically check for any visible damages to the carton and inspect the inverter right away if the carton shows signs of penetration during the storage period. Replace the carton, if necessary.

---

**NOTE:** A thorough and professional inspection may be required before installing the inverter after more than six months in storage. Contact a local Schneider Electric sales representative for information on how to arrange the inspection.

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**IMPORTANT:** Storage beyond two years voids the warranty.

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## Lock-Out Tag-Out (LOTO) Procedure

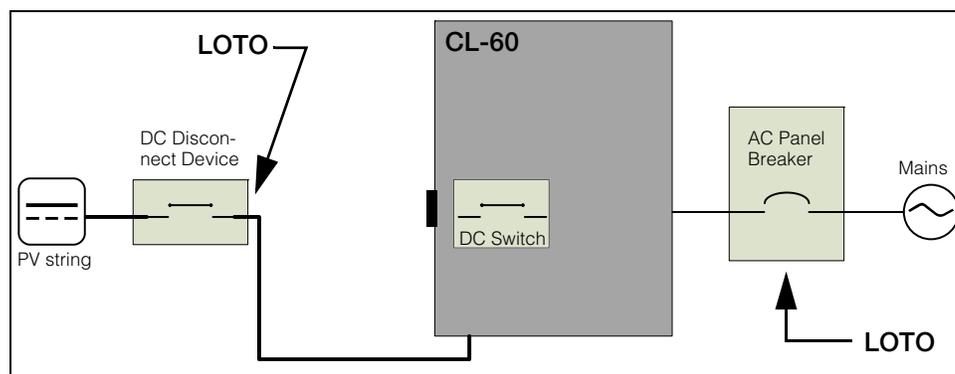
Lock-out refers to the practice of preventing de-energized circuits from being re-energized by putting locks on the disconnecting devices, holding them open. Tag-out refers to the practice of attaching a tag to the disconnect-device locks warning others not to operate the disconnect device and containing information relating to the lock-out, such as the person responsible, the reason, and the date and time. Combined these two practices are called the lock-out and tag-out (LOTO) procedure.

**⚠️ DANGER**

**ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARDS**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The inverter is energized from multiple sources. Before opening the cover identify the power source (see **A**), de-energize (see **B**), lock-out and tag-out (see **C**), and wait ten minutes for circuits to discharge (see **D**).

**Failure to follow these instructions will result in death or serious injury.**



**Figure 1-1** Single Line Diagram for CL-60

- A** 1. Identify any disconnect device upstream from the CL-60 unit.
- B** 2. Open the disconnect device that connects to the CL-60 to cut off DC power.
- C** 3. Turn the CL-60's DC Switch to OFF position.
4. Lock-out and tag out the external DC disconnect device.
5. Remove all PV string connectors from the DC terminals.

- A** 6. Identify the AC Panel Breaker downstream from the CL-60 unit.
- B** 7. Open the AC Panel door.
  - 8. Turn Off the AC Panel Breaker (open the switch) that connects to the CL-60 to cut off AC power.
  - 9. Close the AC Panel door.
- C** 10. Lock-out and tag out the AC Panel.
- D** 11. Wait ten minutes for the circuits in the CL-60 to discharge.
  - 12. Check that the inverter is in zero energy state before performing work.
  - 13. Open the CL-60 enclosure and commence service and maintenance activities.

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# 1

# Introduction

Chapter 1 contains general information about:

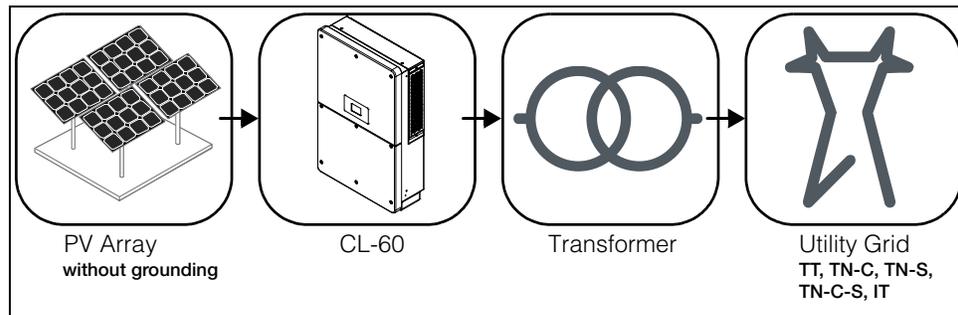
- Conext CL-60
- Physical Features
- Technical Features

## Conext CL-60

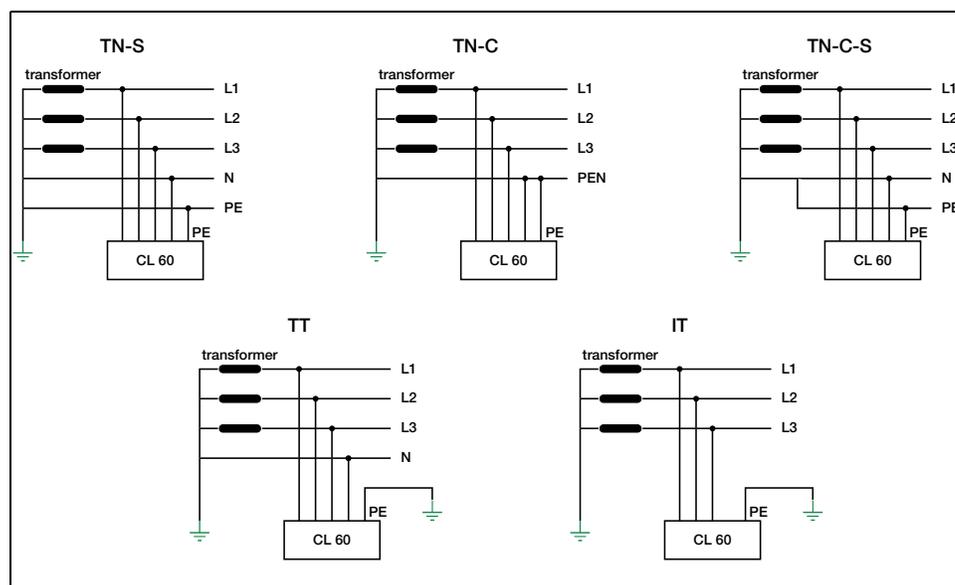
The Conext CL-60 (also referred to as CL-60 PV Inverter) is a transformerless three-phase PV string inverter that is designed to be an integral part of any utility grid-connected PV Power System.

The Conext CL-60 is designed to convert DC power generated from the PV array into AC power that is compatible with utility grade AC power. The following diagram illustrates its fundamental application.

<b>⚠ WARNING</b>
<b>ELECTRICAL SHOCK HAZARD</b>
<ul style="list-style-type: none"><li>• Do not connect the inverter to a PV string where the positive and negative terminals of the PV strings need to be grounded.</li><li>• Do not connect any local load between the inverter and the AC circuit breaker.</li><li>• Use the inverter ONLY in a grid-connected PV system.</li></ul>
<b>Failure to follow these instructions can result in death or serious injury.</b>



**Figure 1-1** Fundamental Application



**Figure 1-2** Type of Grid Connections

### Grid Connection Conditions

More than one CL-60 PV Inverter can be connected to the PV system if the total capacity of the PV system (PV array) exceeds the capacity of a single inverter. Each inverter in the multiple setup connects individually to a PV string at the inverter's DC input side. Then the inverter's AC output side connects to the AC mains (the grid).

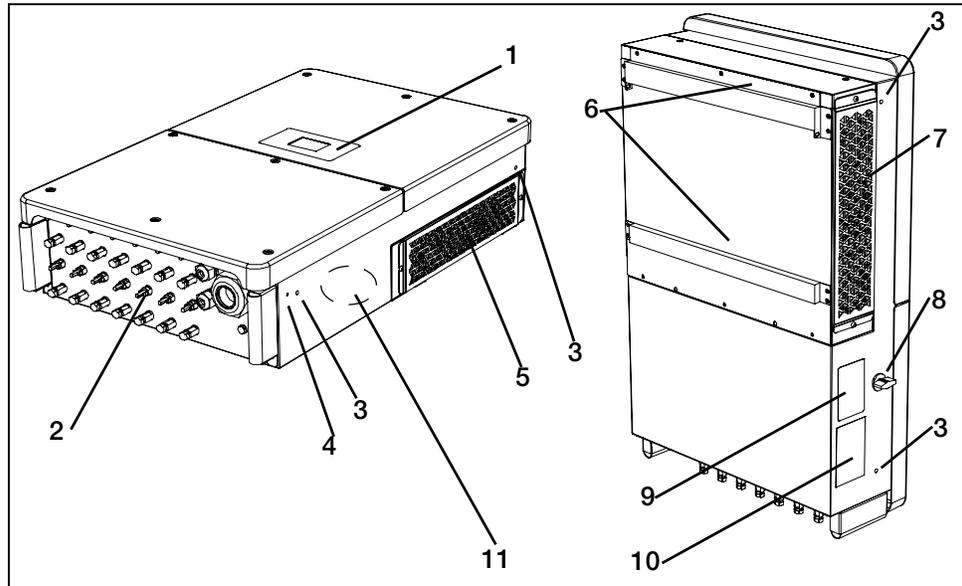
## NOTICE

### EQUIPMENT DAMAGE

Follow local regulations when installing a connection to a either a **TT** or **TN** system. An additional external Type B RCD (residual current detection) device rated 300 mA continuous may be required and combined with additional automatic disconnect devices.

**Failure to follow these instructions can result in equipment damage.**

## Physical Features



**Figure 1-3** CL-60 Components (CL-60E shown)

Item	Description
1	<b>LCD Display</b> is the main HMI for viewing operational information and changing parameter values for settings.
2	<b>Electrical connection area</b> includes the DC terminals, AC terminals, and RS-485 communication terminals.
3	<b>Hole Inserts for Screw-in Handles</b> are used for seating the screw-in handles. The handles are used for moving, handling, and mounting the PV Inverter.
4	<b>PE second terminal</b>
5	<b>Air ventilation</b> is equipped with fans to draw hot air out.
6	<b>Backplate</b> is used to hang the PV Inverter onto the wall.
7	<b>Fans (3x) with protective grate</b> are used for forced-air cooling inside the inverter enclosure.
8	<b>DC switch</b> is a protective component for safely disconnecting DC power from the PV Array but only up to the terminals.  For full disconnection, disconnect power from the PV disconnect device. See “Single Line Diagram for CL-60” on page xi.
9	<b>Warning Label</b> Read before installing, maintaining, and servicing the unit.
10	<b>Rating Label</b> contains the unit’s electrical specifications and regulatory markings.
11	CL-60A has an AC Switch in the area shown.

## Dimensions

### Inverter Dimensions

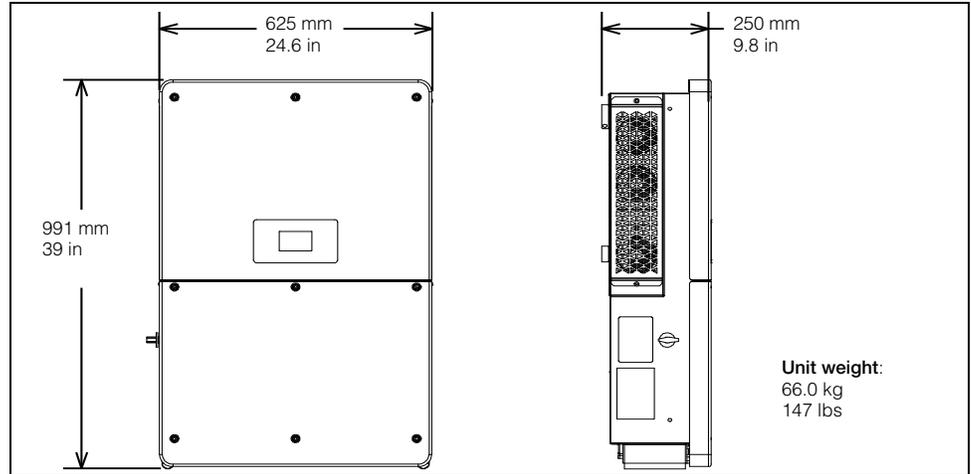


Figure 1-4 Conext CL-60 Dimensions (CL-60E shown)

### Packaging Box Dimensions

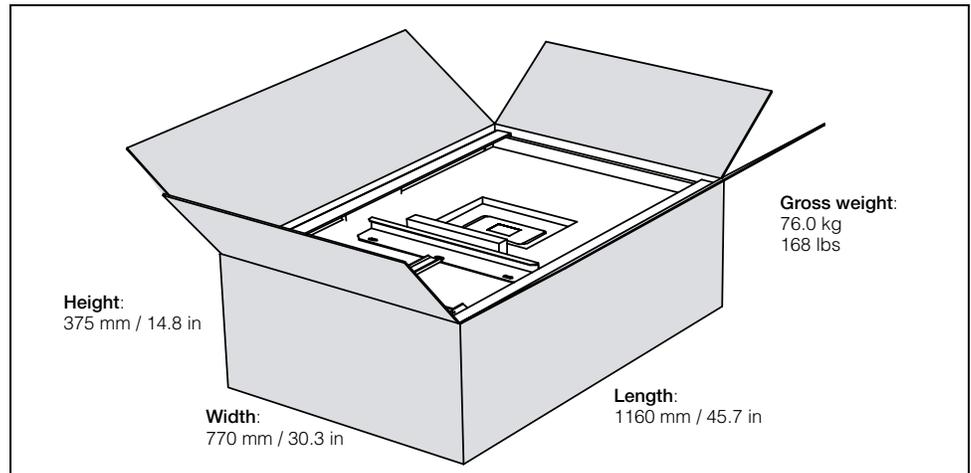


Figure 1-5 Conext CL-60 Packaging Box Dimensions

Product Label

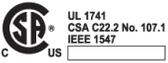
product name	<b>Schneider Electric</b>	
	<b>Conext™ CL-60A</b> Three Phase Photovoltaic Grid Tie Inverter 	
product ratings	DC Max. Input Voltage	1000V ~
	DC Full Power MPPT Voltage Range	550-850V ~
	DC Max. Input Short Circuit Current	140A ~
	DC Max. Current Per Connector	30A ~
	AC Nominal Output Voltage	380V ~
	AC Voltage Operating Range	295-456V ~
	AC Nominal Output Frequency	60Hz ~
	AC Nominal Output Power	60000W ~
	AC Max. Continuous Apparent Power (1 PU)	63400VA ~
	AC Nominal Output Current	91A ~
	AC Max. Continuous Output Current	96A ~
	AC Max. Output Fault Current	102A ~
AC Max. Utility Backfeed Current	0A ~	
Power Factor	0.8 lead to 0.8 lag adjustable ~	
certification and regulatory markings	Enclosure Type	Type 4X (Electronics), Type 3R (Rear Portion)
	Operating Temperature Range	-25°C to +60°C (-13°F to +140°F)
	Part Number	PVSL60A <span style="float: right;">product part number</span>
		<input type="text" value=""/> <span style="float: right;">serial number</span>
	Grid Support Utility Interactive Inverter 	<input type="text" value=""/> <span style="float: right;">manufacturing date</span>
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Figure 1-6 Example of a Conext CL-60 Product Label

## LCD Display

The LCD Display is the main interface of the CL-60 PV Inverter. It is made up of two LED indicators, two buttons, and the screen itself.

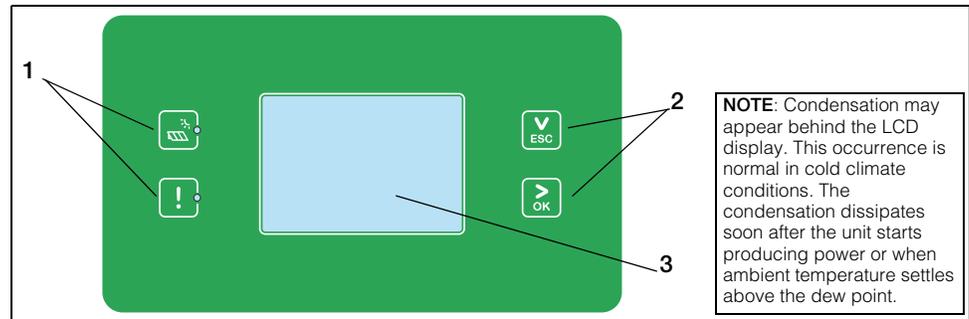


Figure 1-7 LCD Display

Item	Description
1	<b>LED Indicators – RUN</b>  and <b>ALERT</b>  . Indicates the present operational state of the PV Inverter.
2	<b>Selection Buttons – ESC (and down)</b>  and <b>OK (and next)</b>  . Use for navigating the LCD interface, selecting settings, and changing parameters of settings.
3	<b>LCD Screen.</b> Displays the present state of the PV Inverter, operational and alarm information, and present settings.

Table 1-1 Description of LED Indicators

LED Indicators	Description
 <b>RUN - On</b>	The PV Inverter is in operation.
 <b>ALERT - Off</b>	
 <b>RUN - Off</b>	A ground fault (or any event) is detected or a protection feature is enabled.
 <b>ALERT - On</b>	
 <b>RUN - Off</b>	The PV Inverter is not in operation or a communication fault is detected between the DSP and the LCD Display.
 <b>ALERT - Off</b>	
 <b>RUN - flashing</b>	The PV Inverter is communicating a warning.
 <b>ALERT - Off</b>	

## DC Switch

The DC Switch is both the main power switch and a protective component which is used to safely disconnect DC power between the PV array and the PV Inverter whenever necessary to do so.

The PV Inverter operates automatically (without the need of switching On or Off) when DC input and AC output requirements are continuously met. Turn the DC switch to the Off position only to stop PV Inverter operation when a ground fault condition is detected or when there is a non-ground fault condition to stop inverter operation such as maintenance and servicing.

### **⚠ WARNING**

#### **ELECTRIC SHOCK HAZARD**

- Do not perform maintenance and servicing without totally disconnecting the DC source from the inverter. The DC switch does not de-energize the DC fuse circuits. The fuse circuits remain live even if the DC switch is turned to the Off position.
- To remove power to the inverter, disconnect power from the PV disconnect device. See “Single Line Diagram for CL-60” on page xi.
- Alternatively, to remove power to the inverter, open all MC4 type connectors using a special tool for disconnection.

**Failure to follow these instructions can result in death or serious injury.**

---

**NOTE:** For CL-60A, the DC switch is provided with a lockable twisting knob to meet the NFPA 70E standard.

---

# Technical Features

## CL-60 Circuit Diagram

Figure 1-8 shows the main circuit of the PV Inverter.

Maximum Power Point Tracking (MPPT) is utilized to optimize harvesting DC power from the PV array with different PV input conditions.

The PV Inverter circuit converts DC power into AC power and feeds it to the utility grid through the inverter's AC terminal. The protection circuit is equipped to ensure the device's safe operation and personal safety.

The DC switch is used to disconnect DC power from the PV Array safely.

The inverter provides standard RS-485 ports for communication.

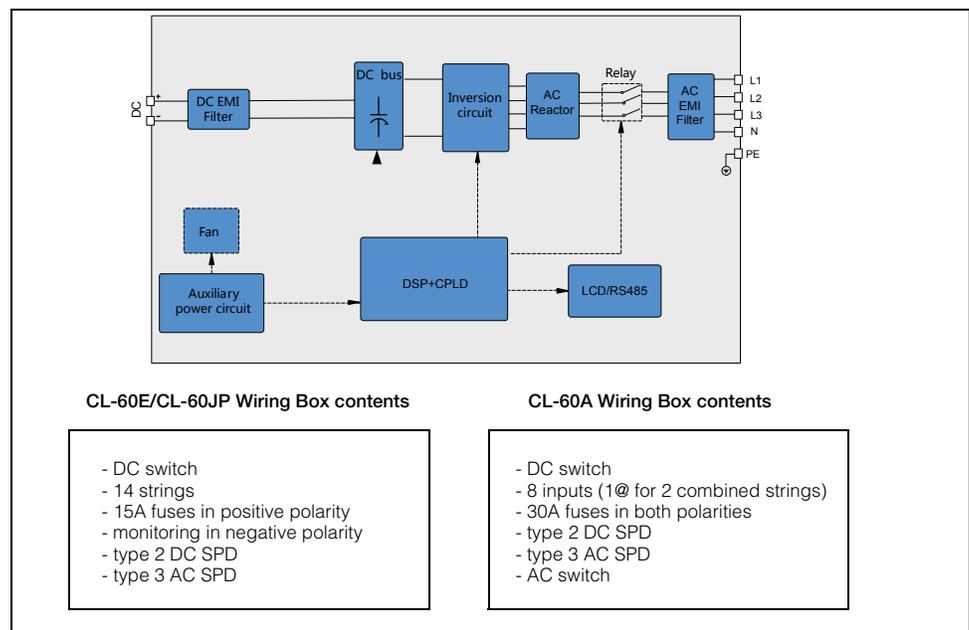


Figure 1-8 Conext CL-60 Circuit Diagram

## Standard Features

**Inverter Function** The device's main function is to convert DC current into grid-compatible AC current then feed this current into the grid.

**Data Storage and LCD Display** The onboard memory stores information such as fault detection and displays them on the screen of the integrated LCD Display.

**Device Configuration** The LCD Display provides the main interface for accessing device settings and changing them for optimal operation of the inverter.

**Communication Interface** Features a standard RS-485 port which can be connected with a monitoring device such as a power meter,

**Protection Features** The unit is equipped with the following features for preventing inverter damage, other equipment damage, and personal injury hazards.

- Short-circuit protection
- Ground insulation resistance detection
- Inverter output voltage monitoring
- Inverter output frequency detection
- Residual current protection
- DC injection of AC output current surveillance
- Anti-islanding protection
- Ambient temperature monitoring
- DC over-voltage protection
- Over-current protection
- Power module over-temperature protection
- Fan failure protection
- Arc fault detection and protection (for CL-60A)

## Derating Feature

Output derating is a way to protect the inverter from overload or potential fault detections. These situations prompt the PV Inverter to initiate power derating:

- Altitude higher than 3000 meters
- Internal temperature is too high (including ambient temperature and internal components temperature)

---

**NOTE:** For example, installing the inverter in an enclosed space may hasten derating.

---

- Grid voltage is too low
- External power class adjustment
- Grid frequency is too high (see NOTE)

---

**NOTE:** Valid only when the country selected is DE or IT.

---

- High grid voltage with a simultaneous low PV voltage.

**Power Limit Setting** Inverter output power can be adjusted via the LCD Display or a remote grid dispatch from the utility company. The corresponding operating state will be displayed on the LCD screen.

**Over-temperature Derating** High ambient temperature, a blocked fan, or poor ventilation will initiate inverter power derating.

When the temperature inside the unit exceeds the upper limit, the inverter will derate its power output until the internal temperature drops within the allowable range.

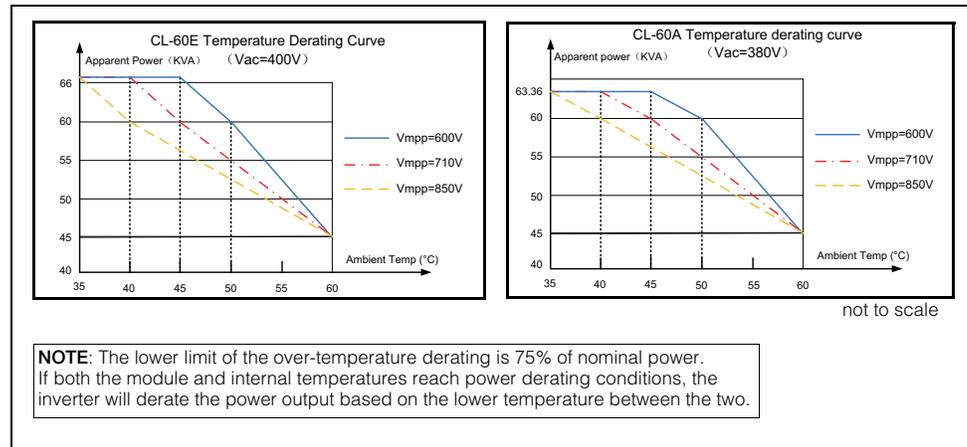


Figure 1-9 Over-Temperature Derating

**Grid Under-voltage Derating** When grid voltage is low, the inverter will derate the output power to make sure the output current is within the allowable range. Once the grid voltage is within Vmin (215V), the inverter will derate its output power.

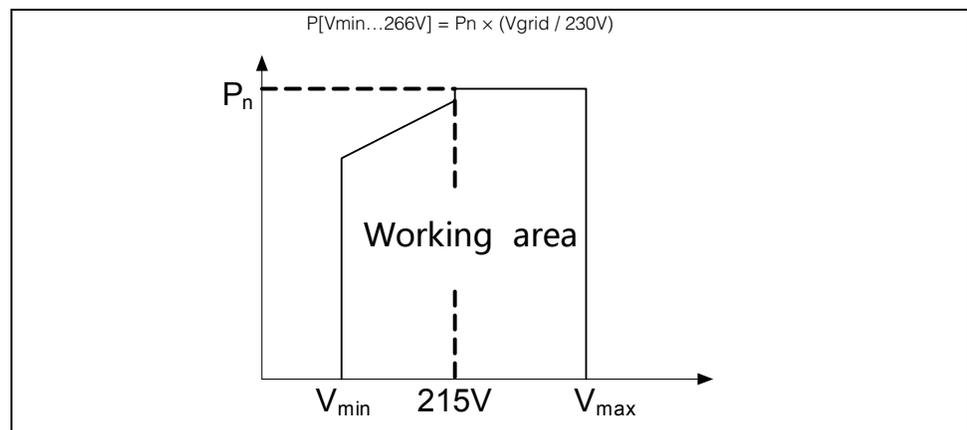
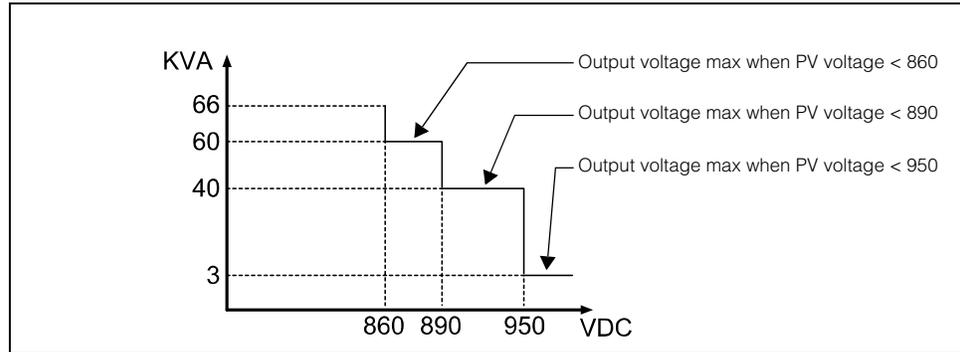


Figure 1-10 Grid Under-Voltage Derating

**PV Over-voltage Derating** The inverter regularly scans the PV voltage every 25 minutes and forces the PV to derate to test whether the maximum power point is less than 860 volts.

At 66 KVA, if the maximum power point is higher than 860 volts, then the inverter will return to the higher voltage limit before it starts derating.



**Figure 1-11** PV Over-Voltage Derating

# 2

# Installation

Chapter 2 contains information about:

- Pre-Installation
- Installation

## Pre-Installation

Before installing the Conext CL-60, read all instructions and cautionary markings in this Guide.

---

**NOTE:** Obtain all necessary permits prior to starting the installation.  
**Installations must meet all local codes and standards.** Installation of this equipment should only be performed by skilled personnel such as qualified electricians and Certified Renewable Energy (RE) System installers.

---

## Planning the Installation

- Read this entire chapter before beginning the installation. It is important to plan the installation from beginning to end.
- Assemble all tools and materials needed for the installation.

# Installation

## **⚠️ ⚠️ DANGER**

### **ELECTRIC SHOCK AND FIRE HAZARD**

- Do not connect the PV Inverter to a live power source prior to cabling and wiring found in Chapter 3, “Electrical Connections”. The inverter can be energized from two sources namely, DC from the PV array and AC from the grid.
- Do not connect any powered device to the PV Inverter during installation.

**Failure to follow these instructions will result in death or serious injury.**

## What's In The Box

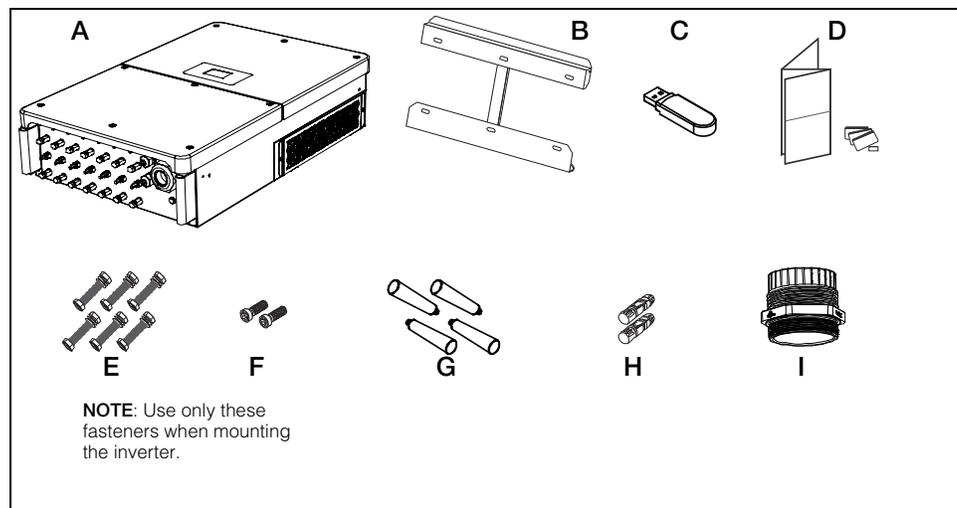
The following materials are supplied in the Conext CL-60 package:

### First Row

- **A** CL-60 unit
- **B** Wall-mounting backplate
- **C** CL-60 USB drive contains the CL-60 Owner's Guide
- **D** CL-60 Quick Install Guide including extra multi-lingual product labels

### Second Row

- **E** Metal frame M10x45 fasteners (6x)
- **F** M4x16 backplate screws (2x)
- **G** Screw-in handles (4x)
- **H** MC4 DC cable connectors (14x pairs) for the CL-60E/CL-60JP  
Amphenol® H4 DC cable connectors (8x pairs) for the CL-60A
- **I** AC cable gland (for the CL-60E/CL-60JP)



**Figure 2-1** What's In the Box

## Material and Tools

The following materials and tools are not supplied but are required to complete the installation:

- Personal protective equipment (PPE)
- Screwdriver and drill set (powered and/or manual)
- Six (M10x65) screws (for fastening wall-mounting backplate to the wall)
- Calibrated professional digital multimeter
- Crimping tool from Multi-Contact (<http://www.multi-contact-usa.com/> for CL-60E/CL-60JP) and Amphenol (<https://www.amphenol.com/> for CL-60A)

## Location Information

 **DANGER**

**ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARDS**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes. See “Lock-Out Tag-Out (LOTO) Procedure” on page xi.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.

**Failure to follow these instructions will result in death or serious injury.**

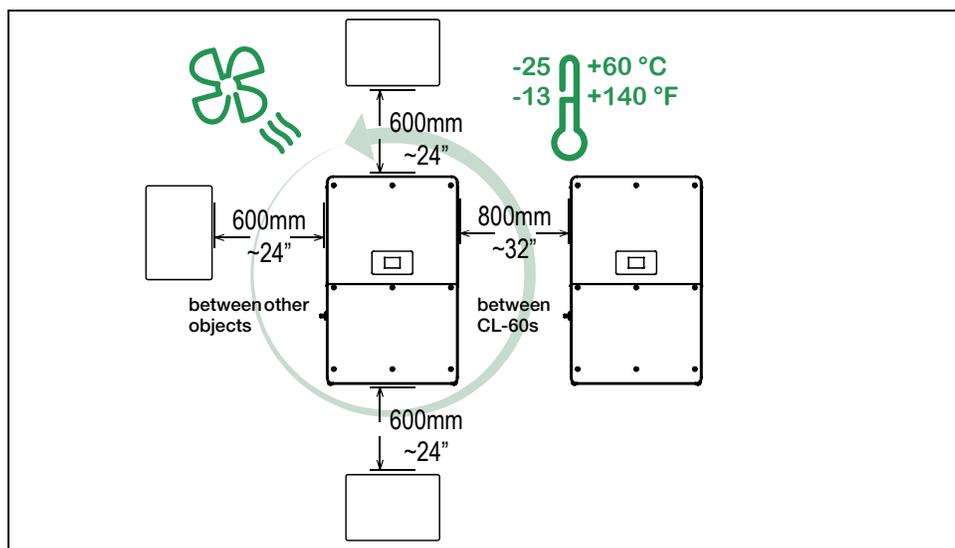
### Environment

The CL-60 is IP65 rated (CL-60E/CL-60JP) and Type 4X rated (CL-60A). It is suitable for outside installation.

The ambient temperature should be within the range of  $-25$  to  $60$  °C ( $-13$  to  $140$  °F) to prevent automatic power derating in over-temperature conditions. Relative humidity at the installation site can be from 0 to 100%.

Allow for at least 600 mm (~24 inches) clearance on all sides of the inverter. When installing another inverter next to it (or several inverters around it), increase the clearance between inverters from all sides to 800 mm (~32 inches).

See Figure 2-2, “Clearances and Ambient Temperature” on page 2-5.



**Figure 2-2** Clearances and Ambient Temperature

## Fire Safety

### ⚠ WARNING

#### IGNITION AND FIRE HAZARD

- This equipment is not ignition protected. To prevent fire or explosion, do not install this product in locations that require ignition-protected equipment. This includes any confined space containing lead acid batteries, or flammable chemicals such as, natural gas (NG), liquid petroleum gas (LPG) or gasoline (Benzine/Petrol).
- Do not install in a confined space with machinery powered by flammable chemicals, or storage tanks, fittings, or other connections between components of fuel or flammable chemical systems.
- Do not install the CL-60 on a wooden/plastic/plaster wall.
- Do not install the CL-60 near readily flammable materials such as cloth, paper, straw, or plastic sheeting. Keep flammable materials from all sides including the front of the CL-60.

**Failure to follow these instructions can result in death or serious injury.**

Flammable or combustible materials are defined as “any material containing wood, compressed paper, cellulose, plant fibers, plastics, liquids, or other material that will ignite and burn, whether flame-proofed or not” according to NFPA 70E. Flammable liquids are defined as “any liquid whose flash point does not exceed 100 °F (38 °C).” Examples of flammable liquids are gasoline, methanol, and ether.

When choosing a wall or flat surface to install the CL-60, choose a wall or flat surface that is not considered a flammable material such as concrete, brick, or metal.

**Handling  
Precautions**

<b>⚠ CAUTION</b>
<p><b>HEAVY LOAD HAZARD</b></p> <ul style="list-style-type: none"><li>• Do not handle and lift the unit by yourself. Use two people to move, lift, and mount the unit.</li><li>• Always use proper lifting techniques during installation including using the provided screw-in handles.</li><li>• When handling the inverter, install all four screw-in handles to both sides of the inverter first and make sure they are seated correctly in their slots.</li><li>• Do not substitute the screw-in handles with something else. Use only the provided screw-in handles.</li><li>• Use mechanical or motorized hand trucks and/or lifts whenever possible to aid in proper handling.</li></ul> <p><b>Failure to follow these instructions can result in moderate or minor injury.</b></p>

**Storage  
Considerations**

If the inverter cannot be installed immediately after delivery at the installation site, consider storing the inverter inside its original carton and setting it aside away from potential damage. For more guidelines, see “Storage Information” on page x.

**Location Hazards**

In order to avoid other potential hazards follow the instructions in the WARNING below.

<b>⚠ WARNING</b>
<p><b>ELECTRICAL SHOCK, FIRE, AND PHYSICAL INJURY HAZARD</b></p> <ul style="list-style-type: none"><li>• Install the CL-60 on a concrete wall or metal frame which can support the weight (66 kg /147 lbs) of the unit over time. When installing multiple units, make sure the wall or metal frame can support the total weight of the units over time.</li><li>• Install the unit upright at 90° vertical angle in relation to the floor. The unit can also be installed horizontally flat and parallel to the floor. When installing on a slope, the top of the unit must be higher than its bottom.</li><li>• Install the unit at the recommended height of 1.2 m (4 ft.) for easy access to the terminals and ports.</li><li>• Avoid installing the CL-60 in completely uncovered locations where persistent rain and moisture spray can eventually penetrate the enclosure. Install under a covered structure.</li><li>• Install a separate and external surge protection device to protect the CL-60's power module and communication ports.</li></ul> <p><b>Failure to follow these instructions can result in death or serious injury.</b></p>

**NOTICE****EQUIPMENT DAMAGE**

- Avoid installing the CL-60 in direct sunlight or near other heat sources like the exhausts of inverters and generators, steam exhausts from boilers and dryers, and engine compartments. Install in shaded locations.
- Choose a location and an installation layout that minimizes potentially induced voltage spikes that might damage the electronics.

**Failure to follow these instructions can result in equipment damage.**

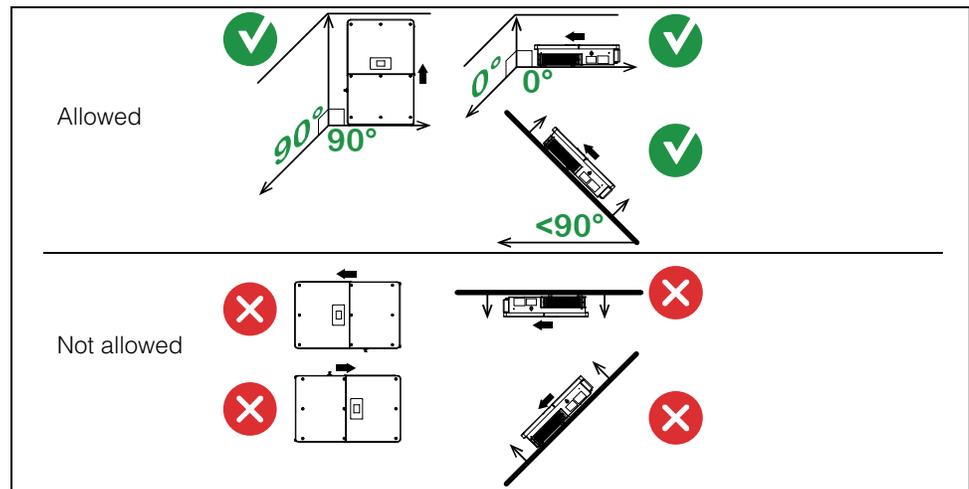
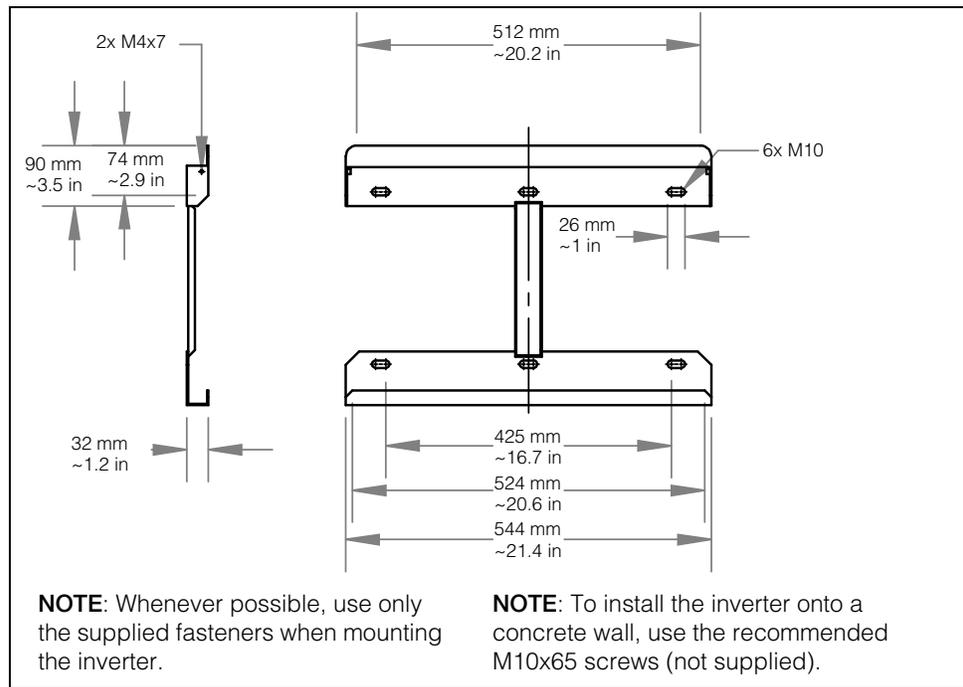


Figure 2-3 Mounting Orientations

## Install and Mount the CL-60



**Figure 2-4** Wall-mounting Backplate Dimensions

**To install on a concrete or brick wall in an upright position:**

1. Remove the wall-mounting backplate and the two M4x12 backplate screws from the CL-60 packaging.
2. Follow all preceding precautions and warnings starting on page 2-3.
3. Unpack the backplate from the box and use the backplate to mark the location of the holes on the wall. See Figure 2-5, "Mark and Pre-drill Wall" on page 2-9.

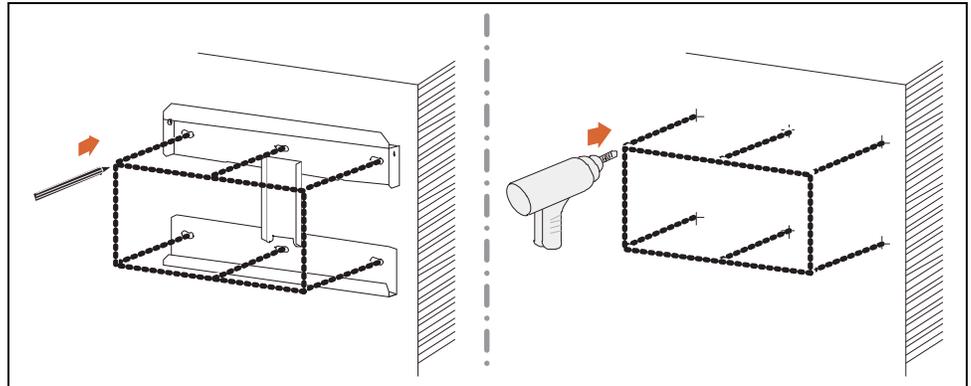
**⚡ ⚠ DANGER**

**EXPLOSION HAZARD**

Check that there are no plumbing or gas pipes or electrical conduits behind the wall when marking for holes and before drilling.

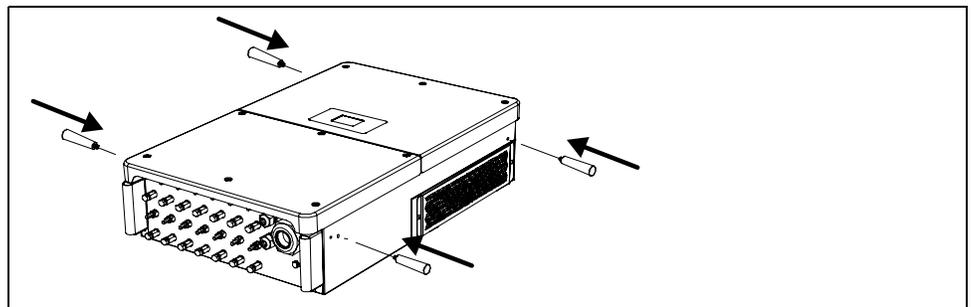
**Failure to follow these instructions will result in death or serious injury.**

4. Pre-drill the mounting surface, if necessary. See Figure 2-5, “Mark and Pre-drill Wall” on page 2-9.



**Figure 2-5** Mark and Pre-drill Wall

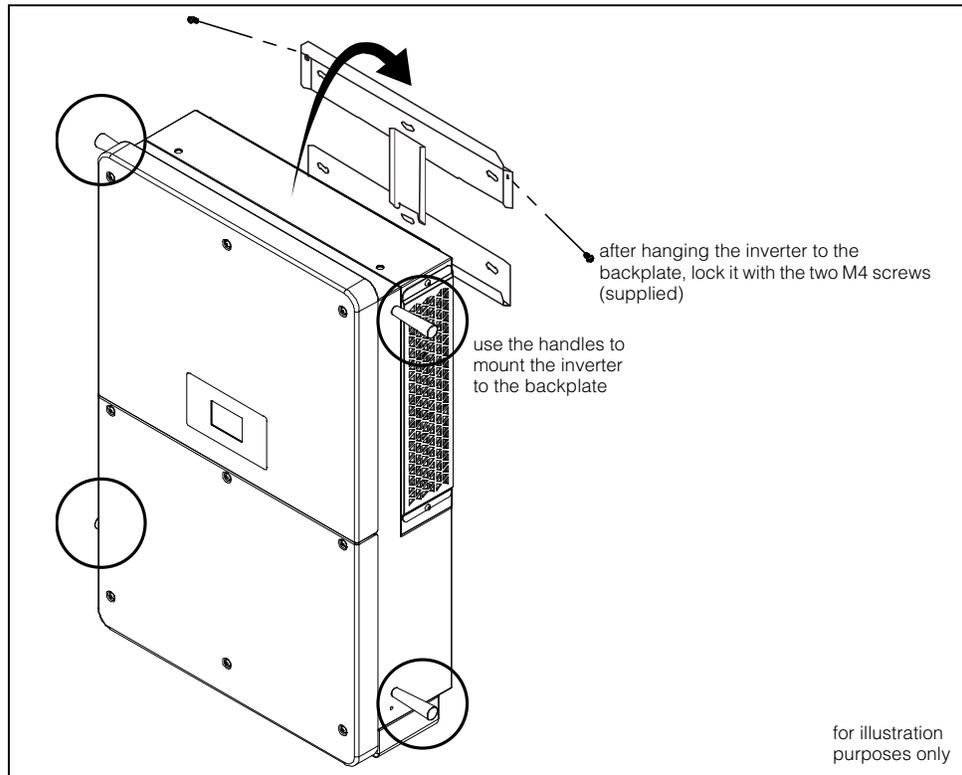
5. Unpack the screw-in handles and install them as shown. Screw in the handles until they are fully seated in the inserts. See Figure 2-6, “Install Screw-in Handles” on page 2-9.



**Figure 2-6** Install Screw-in Handles

6. Fasten the wall-mounting backplate to the wall with six M10x65 screws (not supplied). Use a torque of 35 Nm (25.8 lbf-ft) to fasten the screws and the backplate.

7. Mount (hang) the inverter manually onto the backplate.

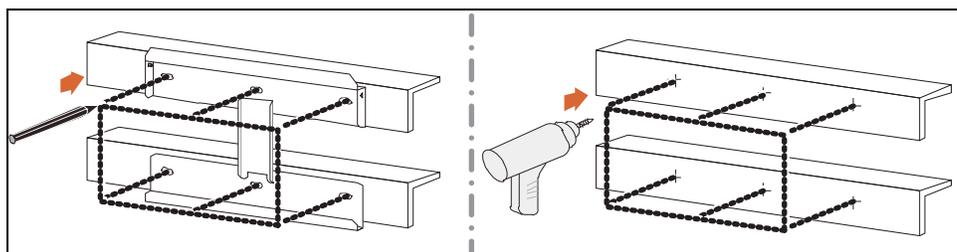


**Figure 2-7** Mounting the CL-60

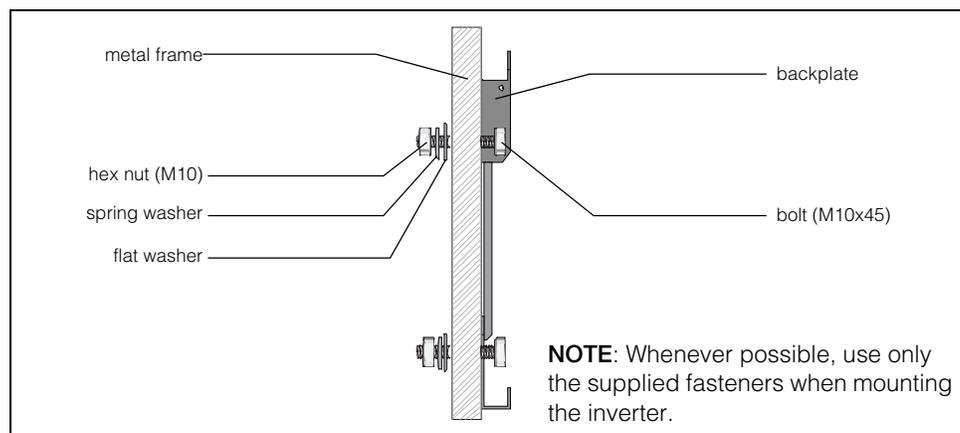
8. Lock the inverter to the backplate by fastening the two screws (M4x16) as shown. See Figure 2-7.
9. Remove the screw-in handles from the sides of the inverter and store them away from the top of the inverter or inside the inverter enclosure.

**To install on a metal frame in an upright position:**

1. Remove the backplate, its corresponding metal frame fasteners, and the two M4x12 backplate screws from the CL-60 packaging. Use only the provided metal frame fasteners for attaching to a metal frame structure.
2. Follow all preceding precautions and warnings starting on page 2-3.
3. Use the backplate to mark the metal frame with the location of the holes to be drilled. See Figure 2-8.
4. Pre-drill the mounting surface, if necessary. See Figure 2-8.  
Use a drill bit appropriate for a bolt of size M10.

**Figure 2-8** Mark and Pre-drill Metal Frame

5. Unpack the screw-in handles and install them as shown. Screw in the handles until they are fully seated in the inserts. See Figure 2-6, “Install Screw-in Handles” on page 2-9 for an illustration.
6. Fasten the backplate to the metal frame using the metal frame fasteners that came with the CL-60 packaging. Use a torque of 35 Nm (25.8 lbf-ft) to fasten the nut and the backplate.

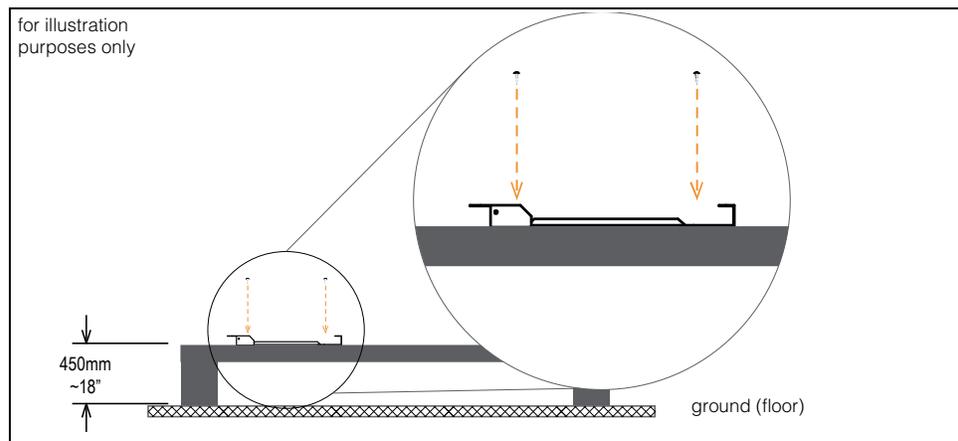
**Figure 2-9** Securing the Backplate to the Metal Frame

7. Mount (hang) the inverter manually onto the backplate. See Figure 2-7, “Mounting the CL-60” on page 2-10 for a similar illustration.
8. Lock the inverter to the backplate by fastening the two screws (M4x16). See Figure 2-7, “Mounting the CL-60” on page 2-10 for a similar illustration.
9. Remove the screw-in handles from the sides of the inverter. See Figure 2-7, “Mounting the CL-60” on page 2-10 for a similar illustration.

To install on a horizontally flat metal or concrete surface:

<b>⚠ WARNING</b>
<p><b>ELECTRICAL SHOCK AND FIRE HAZARD</b></p> <ul style="list-style-type: none"> <li>• Do not install the unit within 800 mm (31.5 inches) of vegetation (weeds, grass) and other flammable materials. See the definition of flammable materials in “Fire Safety” on page 2–5.</li> <li>• Provide a minimum distance of 450 mm (~18 inches) between the PV Inverter’s back and the ground (the floor).</li> <li>• Install the backplate even though the inverter is not going to hang on it. The backplate provides stability for the inverter.</li> <li>• Be careful to check that there are no plumbing or gas pipes or electrical conduits underneath the flat surface you are marking for holes.</li> </ul> <p><b>Failure to follow these instructions can result in death or serious injury.</b></p>

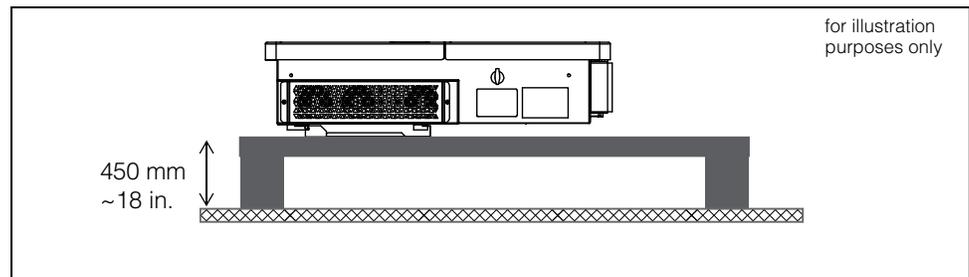
1. Remove the wall-mounting backplate and its corresponding fasteners from the CL-60 packaging.
2. Follow all preceding precautions and warnings starting on page 2–3.
3. Unpack the backplate from the box and use the backplate to mark the flat surface with the location of the holes to be drilled. See Figure 2-5, “Mark and Pre-drill Wall” on page 2–9.
4. Pre-drill the mounting surface, if necessary. Use a drill bit appropriate for a bolt of size M10.



**Figure 2-10** Ground Clearance and Fastening the Backplate

5. Unpack the screw-in handles and install them as shown. Screw in the handles until they are fully seated in the inserts. See Figure 2-6, “Install Screw-in Handles” on page 2–9.

6. Fasten the backplate to the flat metal surface (using the metal frame fasteners that came with the CL-60 packaging, if necessary) or concrete surface (using M10x65 screws which are not provided). Use a torque of 35 Nm (25.8 lbf-ft) to fasten the nut and the backplate.
7. Lay the inverter manually onto the backplate to lock its position. Handle the inverter by the screw-in handles.



**Figure 2-11** Mounting to a Flat Surface

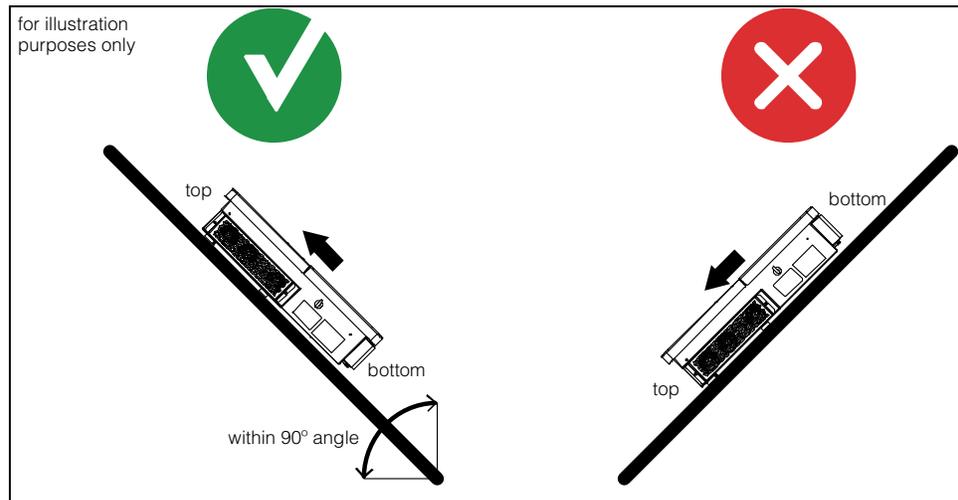
8. Lock the inverter to the backplate by fastening the two screws (M4x16). See Figure 2-7, "Mounting the CL-60" on page 2-10 for a similar illustration.
9. Remove the screw-in handles from the sides of the inverter. See Figure 2-7, "Mounting the CL-60" on page 2-10 for a similar illustration.

**To install on a sloped metal or concrete surface:**

Examples of sloped surfaces are rooftops and uneven terrain.

<b>⚠ WARNING</b>
<b>ELECTRICAL SHOCK AND FIRE HAZARD</b>
<ul style="list-style-type: none"><li>• Do not install the unit on a slope in which the top part of the inverter is lower than its bottom. See Figure 2-12 below.</li><li>• Be careful to check that there are no plumbing or gas pipes or electrical conduits underneath the surface you are marking for holes.</li></ul>
<b>Failure to follow these instructions can result in death or serious injury.</b>

- ◆ Follow the same procedures in the previous section “To install on a horizontally flat metal or concrete surface:” on page 2–12.



**Figure 2-12** Installing on Sloped Surfaces

## Torque Values

### ⚠ CAUTION

#### FIRE HAZARD

Tighten fasteners such as screws, nuts, bolts, and cable glands (used for routing field wiring and current carrying cable) according to the recommendations in the table below. Incorrect torque may cause a fire.

**Failure to follow these instructions can result in moderate or minor injury.**

### NOTICE

#### EQUIPMENT DAMAGE

Tighten fasteners such as wall screws, metal frame nuts, and panel screws according to the recommendations in the table below. Over torquing may damage the head of the fastener. Under torquing may loosen the installation over time.

**Failure to follow these instructions can result in equipment damage.**

**Table 2-1** Summary of Torque Values

Type	Description	Nm (IEC)	ft-lb (NA)
cable gland	for communication cables such as RS-485 Ethernet cable	3.75	2.8
cable gland	for smaller AC cable	12–13	8.8–9.6
cable gland	for larger AC cable	16–17	11.8–12.5
connector screw	RS-485 wire connector	0.2	0.15
fastener	transparent protection panel	0.8 ±0.1	0.6 ±0.1
fastener	lower enclosure panel	4.3 ±0.2	3.2 ±0.15
fastener	to lock the CL-60 unit to the mounting backplate	2.7–4.8	2–3.5
fastener (metal)	metal frame-mounting backplate nut	35	25.8
fastener (wall)	wall-mounting backplate expansion	35	25.8
terminal gland	MC4 DC terminal	2.5–3	1.8–2.2
terminal screw	AC terminal block	8–12	5.9–8.9
terminal screw	PE (ground) terminal block	4.3 ±0.2	3.2 ±0.15

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# 3

## Electrical Connections

Chapter 3 contains information about:

- Precautions
- Cabling and Wiring
- Communication Connection

## Precautions

Before connecting the Conext CL-60 to electrical cables, wires, and communication cables, read all instructions and cautionary markings in this Guide.

---

**NOTE:** Obtain all necessary permits prior to starting the installation.  
**Installations must meet all local codes and standards.** Installation of this equipment should only be performed by skilled personnel such as qualified electricians and Certified Renewable Energy (RE) System installers.

---

## Planning the Electrical Connections

- Read this entire chapter before making electrical connections to and from the unit. It is important to plan the installation from beginning to end.
- Assemble all tools and materials needed for the installation.

---

## Cabling and Wiring

 **DANGER****ELECTRIC SHOCK AND FIRE HAZARD**

- All wiring must be done by qualified personnel to ensure compliance with all applicable installation codes and regulations.
- Do not connect the PV Inverter to a live power source prior to finishing all cabling and wiring. The inverter can be energized from two sources namely, DC from the PV array and AC from the grid.
- Do not connect any powered device to the PV Inverter during cabling and wiring.

**Failure to follow these instructions will result in death or serious injury.**

### Material and Tools

The following materials and tools are not supplied but are required to complete the installation:

- AC power cable (4-wire/5-wire)
- Crimping tool from Multi-Contact (<http://www.multi-contact-usa.com/> for CL-60E/CL-60JP) and Amphenol (<https://www.amphenol.com/> for CL-60A)
- DC power cable (color-coded - red for (+), black for (-))
- one AC conduit hub (for 2" trade size knockout) - CL-60A only
- one (or two) conduit hubs (for 3/4" trade size knockouts) - CL-60A only
- RS-485 cable(s) for Modbus/RS-485 device connections
- Wire stripper, RJ45 crimper, connector tool spanner
- Screwdriver set, pliers
- CAT6/5/e network cable(s) for Modbus/RS-485 PV Inverter and Ethernet TCP/IP connections
- Laptop computer (PC or Mac)
- Network router for LAN and internet connectivity

Once the Conext CL-60 is installed at the site, it is now ready to be connected to the PV array and the utility grid.

 **DANGER**

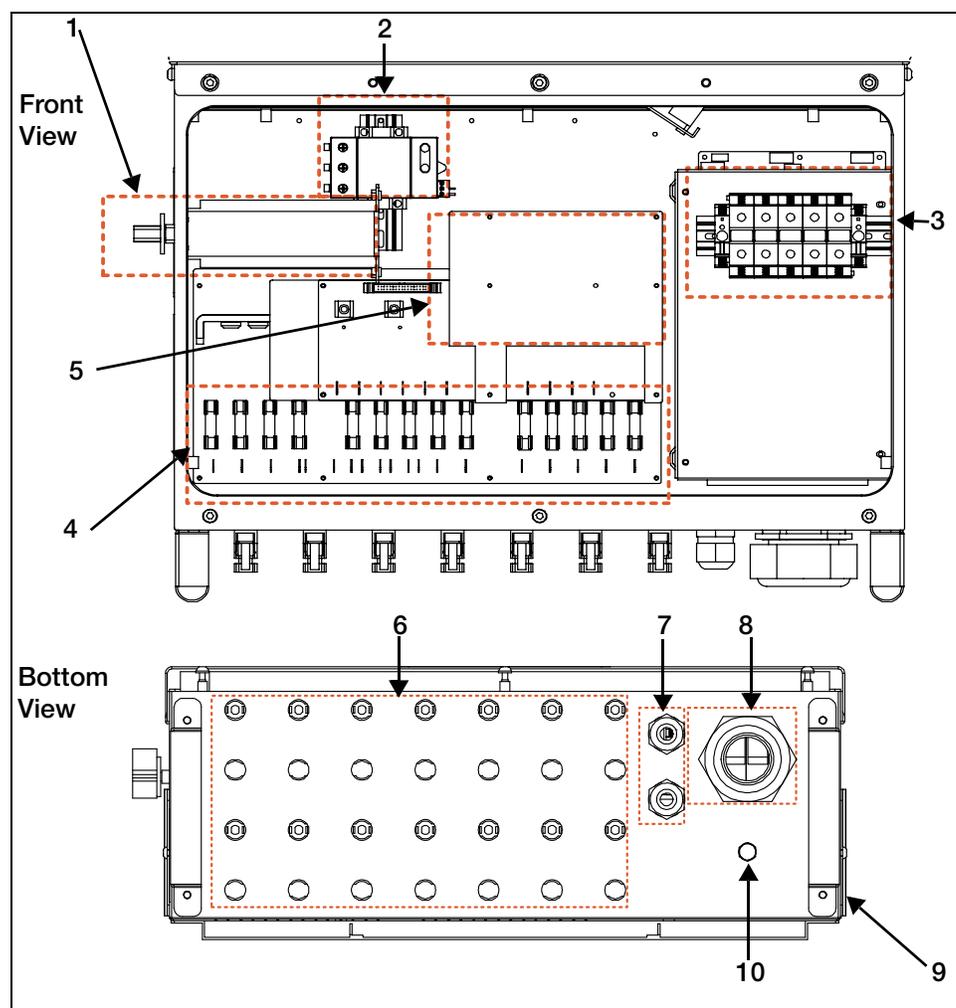
**ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARDS**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes. See “Lock-Out Tag-Out (LOTO) Procedure” on page xi.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.

**Failure to follow these instructions will result in death or serious injury.**

## Terminal and Cable Entry Points (for CL-60E/CL-60JP)

The CL-60E's electrical connection terminals are located inside the inverter wiring box and the cable entry points are at the bottom of the unit.



**Figure 3-1** Terminals and Cable Entry Points

**Table 3-1** Description of Terminals and Cable Entry Points

No.	Description	No.	Description
1	DC switch	6	DC input MC4 terminals
2	DC SPD	7	Communication cable glands
3	AC crimping terminal	8	AC cable gland (large)
4	DC fuse board	9	Second PE (ground) location
5	Communication circuit board	10	Waterproof air valve

## Terminal and Cable Entry Points (for CL-60A)

The CL-60A's electrical connection terminals are located inside the inverter wiring box and the cable entry points are at the bottom of the unit.

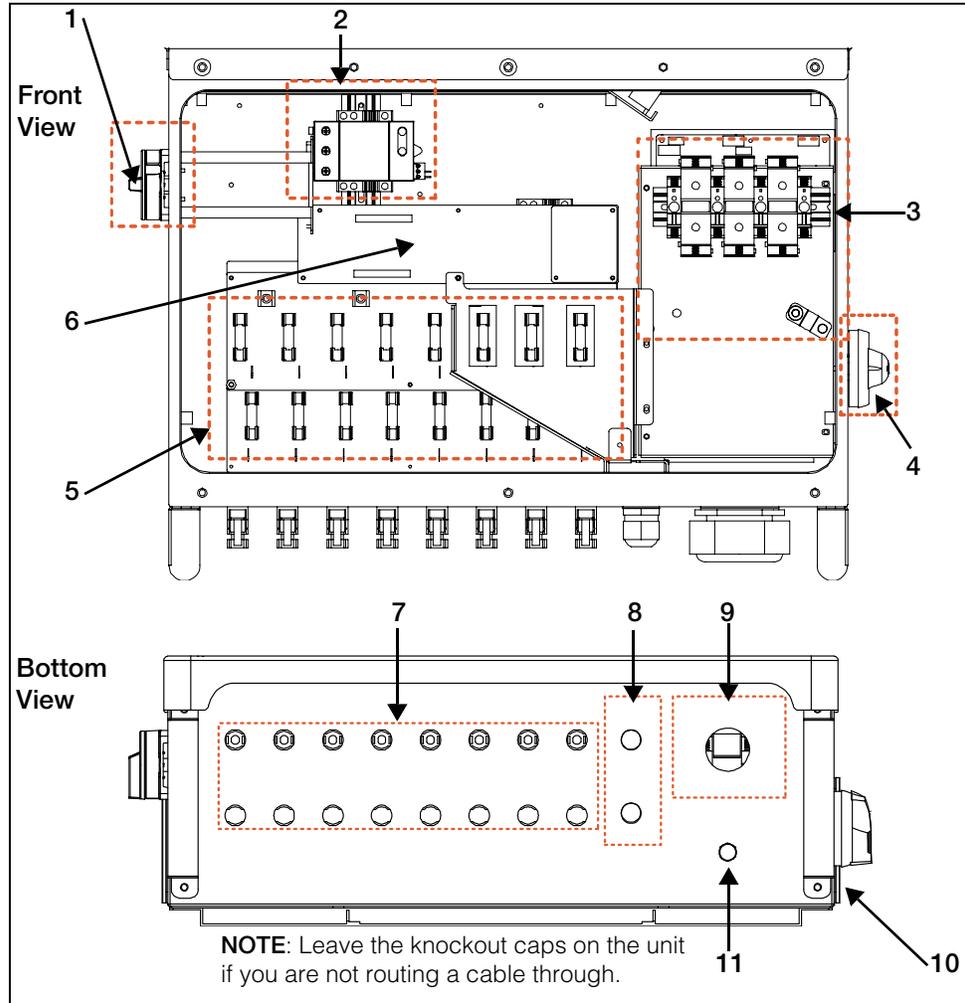


Figure 3-2 Terminals and Cable Entry Points

Table 3-2 Description of Terminals and Cable Entry Points

No.	Description	No.	Description
1	DC switch	7	DC input Amphenol H4 terminals
2	DC SPD	8	3/4" trade size knockouts
3	AC crimping terminal	9	2" trade size knockout
4	AC switch	10	Second PE (ground) location
5	DC fuse board with integrated Arc fault detector	11	Waterproof air valve
6	Communication circuit board		

## AC Side Cable Connection

### AC Side Requirements

**NOTE:** Connection to the utility grid must be done only after receiving approval from the local company.

Before connecting to the grid, verify that both the grid voltage and frequency meet the requirements of the CL-60's voltage and frequency settings. Contact the local utility company for a solution if the grid does not meet the specifications. For information on the settings, see "Product Specifications" on page 8–2.

### AC Circuit Breaker

An independent three- or four-pole circuit breaker must be installed downstream from the inverter before the grid connection. This is to ensure that the inverter can be disconnected safely from the grid.

Inverter	Recommended AC circuit breaker
CL-60E	120A
CL-60JP	
CL-60A	

### **NOTICE**

#### **EQUIPMENT DAMAGE**

- Do not connect multiple PV Inverters to a single circuit breaker.
- Do not connect loads between the PV Inverter and the circuit breaker.

**Failure to follow these instructions can result in damage to the inverter and other connected equipment.**

### Residual Current Device

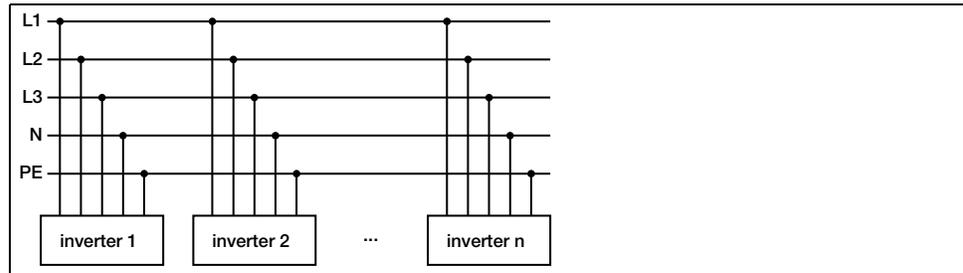
With an integrated comprehensive residual current monitoring component, the inverter is capable of distinguishing a ground fault current from normal capacitive leakage current. This allows the inverter to disconnect from the grid as soon as the ground fault is detected.

## Multiple Inverters in Parallel Connection

Follow either of the two scenarios when attempting to connect several inverters in parallel to the grid.

### Scenario 1

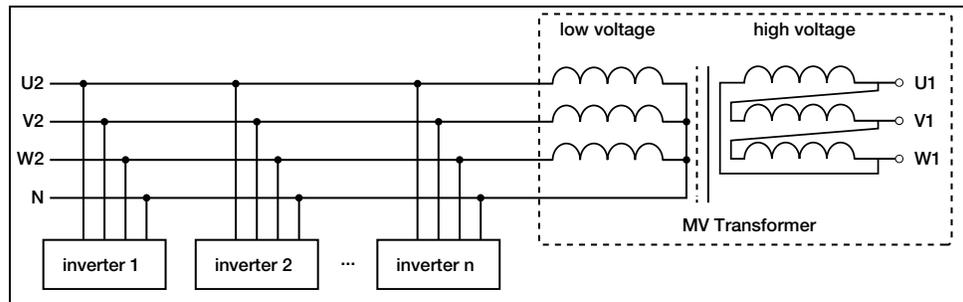
Several inverters are in parallel connection to the 3-phase low voltage grid.



**Requirements** If the number of the grid-connected PV Inverters exceed 40, contact a local Schneider Electric Sales Application Engineer (SAE).

### Scenario 2

Several inverters are in parallel connection to the low voltage side of the MV transformer. The high voltage side is connected to the MV grid.



**Requirements** If the number of the grid-connected PV Inverters exceed 40, contact a local Schneider Electric Sales Application Engineer (SAE).

The nominal power of the MV transformer's low voltage side matches the inverter's output power.

**NOTE:** It is recommended to use a transformer with a short circuit impedance of less than 6%.

## Grid Connection

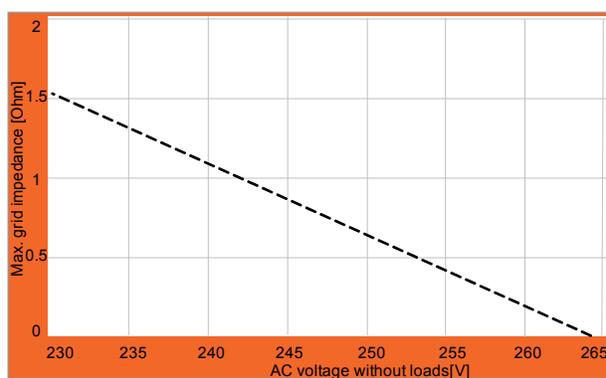
The AC terminal block on the bottom of the CL-60E inverter accommodates an AC connection for a 3-phase-5-wire grid connection (**L1**, **L2**, **L3**, **N** and **PE**).

The AC terminal block on the bottom of the CL-60A inverter accommodates an AC connection for a 3-phase-4-wire grid connection (**L1**, **L2**, **L3**, and **GND**).

### AC Cable Requirements

Select AC cables according to the following factors:

- Grid impedance should correspond to the specifications below to avoid accidental short-circuit or output power derating.



- When calculating voltage drop, a cable with a higher cross section area could be selected to ensure power loss within a 1% limit. Check that the AC cable outer diameter is suitable for the AC terminals of the inverter.
- Ambient temperature
- Cable layout (that is, inside wall, underground, free air, etc.)
- UV resistance
- Cable resistance / length

**AC Cable  
Connection**

To connect the PV Inverter to the grid:

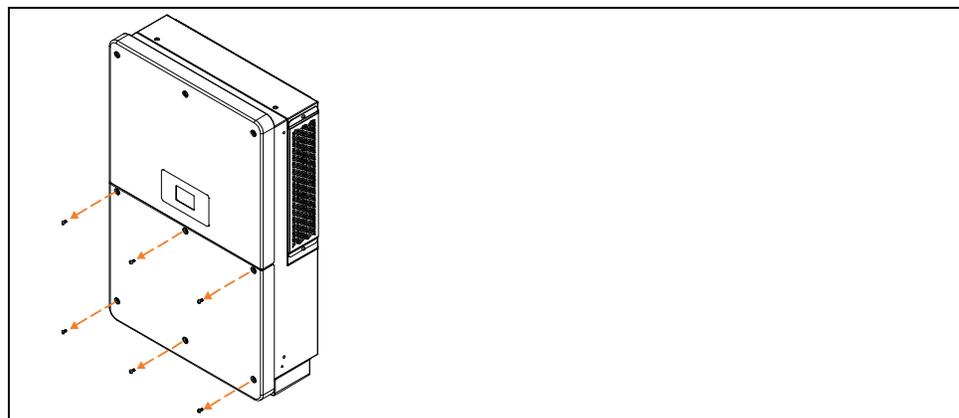
**⚡ ⚠ DANGER**

**ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARD**

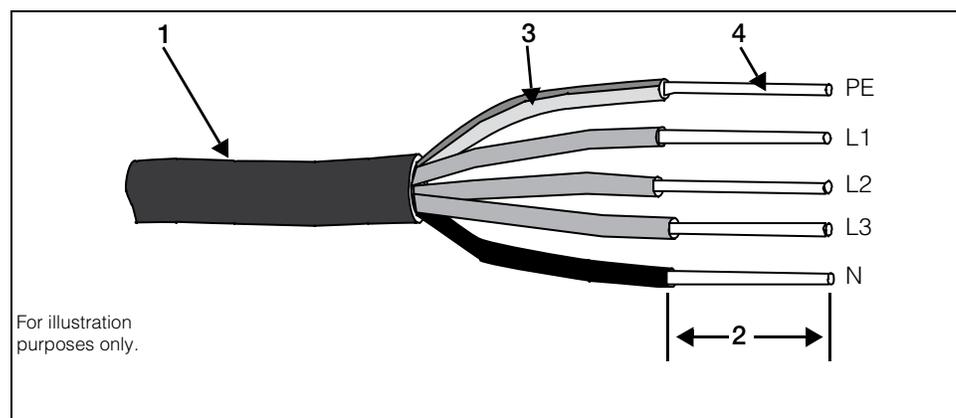
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.
- Do not connect to the AC circuit breaker until all inverter electrical connections are completed.

**Failure to follow these instructions will result in death or serious injury.**

1. Open the AC circuit breaker (turn it OFF) and perform the “Lock-Out Tag-Out (LOTO) Procedure” on page xi.
2. Remove the six screws on the front cover of the wiring box to access the terminals.



3. Strip the cables as shown below. Example below is for a five-wire cable.



**NOTE:** For AC cables with stranded wires, use cold-press terminal lugs for termination. Always use lugs that grip the shape of the wires on AC cables. Always use the proper lugs according to the type of metal of the wires on AC cables.

The cross-section diameter of the AC cable must be selected carefully in order to prevent accidental disconnections of the inverter from the grid due to high impedance of the cable.

No.	Description	Remark
1	Protective layer	External diameter of the cable: Proper range 25 to 40 mm (~1 to 1.5 in)
2	Length of insulation to be stripped off	24 mm (~1 in)
3	Insulation layer	-
4	Cross section of AC cable	Range: 25 to 95 mm <sup>2</sup> Recommended value: 50 mm <sup>2</sup>
5	Type	Aluminum or copper

- Use a smaller AC cable gland (supplied), if the selected AC cable has an external diameter of between 25 to 30.5 mm (~1 to 1.25 in). For replacement instructions, see “To replace the larger AC cable gland with the smaller AC cable gland:” on page 3–14.
- Use a larger AC cable gland (pre-installed), if the selected AC cable has an external diameter of between 30.5 to 40 mm (~1.25 to 1.5 in). There is no need to replace this AC cable gland.

The following table lists the recommended maximum length of the AC cable based on its cross-section diameter.

Cross-section of the AC cable (mm <sup>2</sup> )	Max. length of the AC cables (m) Cu
25	0-50
35	50-100
50	>100

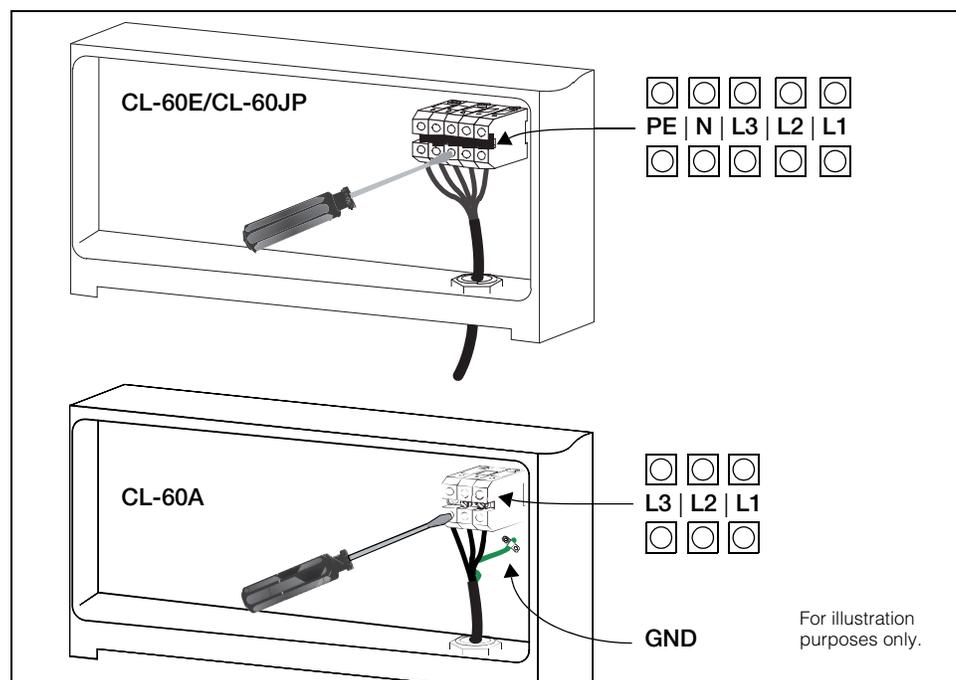
4. Select the corresponding AC cable gland based on the actual AC cable diameter.  
Remove or install the two selected AC cable glands at the bottom of the wiring box using the torque guidelines below.
  - Smaller AC cable gland (supplied for the CL-60E/CL-60JP): Torque of 12-13 Nm (~9.2 lbf-ft)
  - Larger AC cable gland (pre-installed for the CL-60E/CL-60JP): Torque of 16-17 Nm (~12.2 lbf-ft)

***NOTICE***

**INVERTER DAMAGE**  
For the CL-60A, acquire and use a NEMA 4/4X-rated AC conduit hub as required that will fit a 2" trade size knockout.  
**Failure to follow these instructions may cause leakage and damage to the inverter.**

5. Connect the AC cable's wires to their corresponding terminals.

- Pull the cable away from the terminals gently to make sure the wires do not disconnect from their terminals.



## NOTICE

### EQUIPMENT DAMAGE

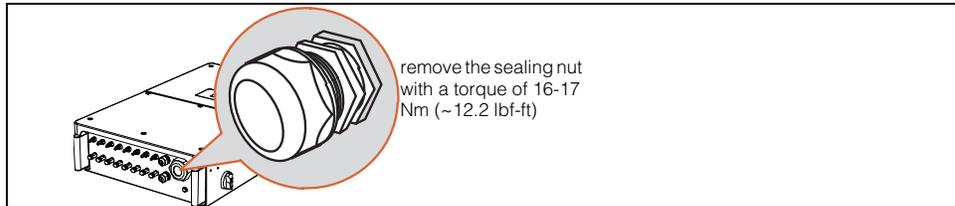
- Observe and strictly follow the AC terminal layout. The PV Inverter will not work normally if the phase wire is connected to the PE terminal.
- Do not insert wires without stripping the insulation layer. Damaged wires may affect the normal operation of the inverter.

**Failure to follow these instructions may cause inverter damage.**

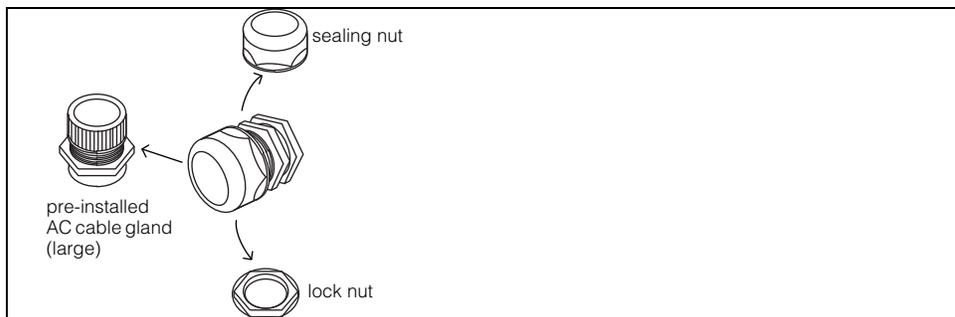
**AC Cable Gland Replacement Instructions for CL-60E/CL-60JP**

**To replace the larger AC cable gland with the smaller AC cable gland:**

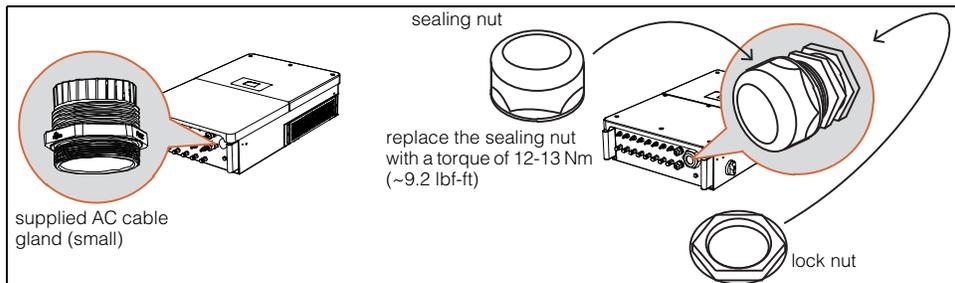
1. Remove the pre-installed larger AC cable gland.



2. Set the sealing and lock nuts aside for reuse.



3. Store the pre-installed AC cable gland (large).
4. Install the supplied AC cable gland (small) onto the unit.



5. Proceed with "AC Cable Connection" steps.

## PV Array Connection

### **DANGER**

#### **ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARDS**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.

**Failure to follow these instructions will result in death or serious injury.**

### **DANGER**

#### **ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARDS**

- Be careful when handling cables from PV arrays. PV arrays produce electrical energy when exposed to light.
- Check that the PV impedance to ground is within specifications before connecting the PV array to the inverter.

**Failure to follow these instructions will result in death or serious injury.**

## PV Input Configuration

The CL-60 PV Inverter has a PV input area and is equipped with a built-in Maximum Power Point Tracker (MPPT).

### **NOTICE**

#### **EQUIPMENT DAMAGE**

- Check and make sure that the voltage capacity rating of each PV array is less than 1000 V.
- Check that the maximum short circuit current on the DC side is within specifications.

**Failure to follow these instructions may cause inverter damage.**

To make full use of the DC input power, PV modules should be homogenous. This means that each module in the PV string must be of the same type and the same number of PV cells. All the PV strings should have identical tilt and orientation.

Before connecting a PV string to the inverter, the following electrical parameters must be met.

Total DC power limit	Max. open-circuit voltage limit for each input	Short-circuit current limit
67500 W <sup>a</sup>	1000 V	140 A

a. Multiply by a factor of 1.35 for over-panelling.

Considering the negative voltage temperature coefficient of PV cells, more attention should be paid to the open-circuit voltage of PV strings when the ambient temperature is the lowest. For example, consider the YL250P-29bPV module.

Item	Parameter
PV module model	YL250P-29b
Power	250W
Open-circuit voltage (STC)	37.6V
Short-circuit current (STC)	8.92A
Open-circuit voltage temperature coefficient ( $\beta$ )	-0.32%/°C
No. of PV modules in a PV string	23

Under the STC condition, where ambient temperature is 25 °C, the open-circuit voltage of PV cells is

$$37.6 \text{ V} \times 23 = 864.8 \text{ V} < 1000\text{V}$$

Suppose that the lowest temperature is -25 °C, the open-circuit voltage of PV cells is

$$23 \times 37.6 \text{ V} \times [1 + \beta \times (\text{min. ambient temperature} - \text{STC temperature})] = 23 \times 37.6 \text{ V} \times [1 + (-0.32\%/^{\circ}\text{C}) \times (-25^{\circ}\text{C} - 25^{\circ}\text{C})] = 990\text{V} < 1000\text{V} \text{ (meets the operational requirement)}$$

Therefore, the PV string should be designed to meet the open-circuit voltage requirement even under the lowest ambient temperature condition.

## PV Input Connection

DC input cables are connected to the PV input terminals of the inverter. DC cables from the PV string should be equipped and terminated with MC4 connectors (CL-60E/CL-60JP only) or Amphenol H4 connectors (CL-60A only).

**NOTE:** To maintain the IP65 / Type 4X protection rating, use only the supplied DC connectors (MC4 or H4). When replacing lost connectors, they have to match the same supplied connectors. Using other connectors will invalidate the warranty.

**Table 3-3** DC Cable Requirements

Model	Cross-sectional area	Cable External diameter	Max. withstand voltage	Max input current for each PV string
CL-60E CL-60JP	4 to 6 mm <sup>2</sup>	6 to 9 mm	1000 V	15 A <sup>a</sup>
CL-60A	12 to 10 AWG	6 to 9 mm	1000 V	30 A <sup>b</sup> (2 combined strings)

a. The recommended current of each DC input should be less than 12 A. Otherwise, the fuse may blow.

b. The recommended current of each DC input should be less than 24 A. Otherwise, the fuse may blow.

## DC Cable Connection

To connect DC input cables to the inverter:

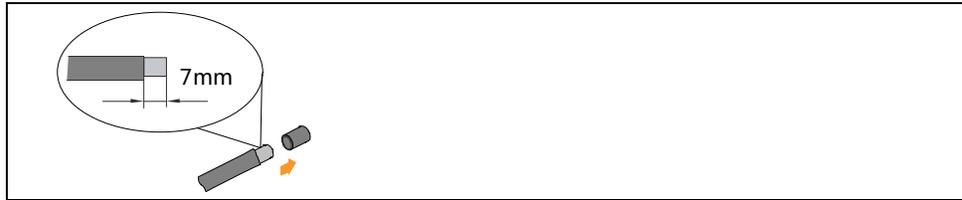
### DANGER

#### ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARD

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.
- Do not connect to the DC circuit breaker until all inverter electrical connections are completed.

**Failure to follow these instructions will result in death or serious injury.**

1. Strip off 7 mm (~¼ inch) of insulation layer from all DC cables. Use a standard wire stripper.



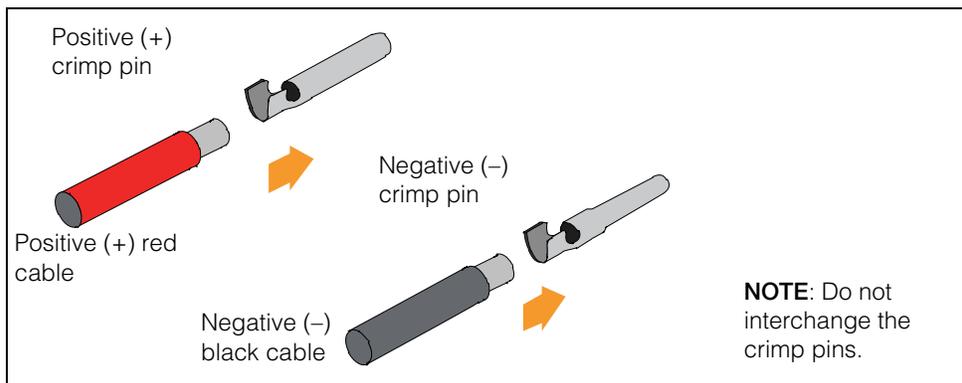
2. Terminate the cable ends with their matching crimp pins (supplied with the DC connector) as shown.

**⚠ CAUTION**

**FIRE HAZARD**

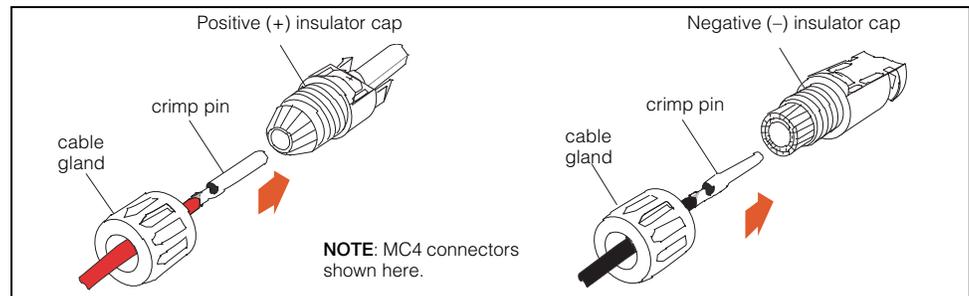
Use only the recommended crimping tool from Multi-Contact (<http://www.multi-contact-usa.com/> for CL-60E) and Amphenol (<https://www.amphenol.com/> for CL-60A). Any other crimping tool may create improperly crimped cables and wires which can cause sparks and a short circuit.

**Failure to follow these instructions can result in moderate or minor injury.**



3. Lead and route the cable through the cable gland of the DC connector.
4. Insert the crimp pin into the insulator cap until it snaps into place.

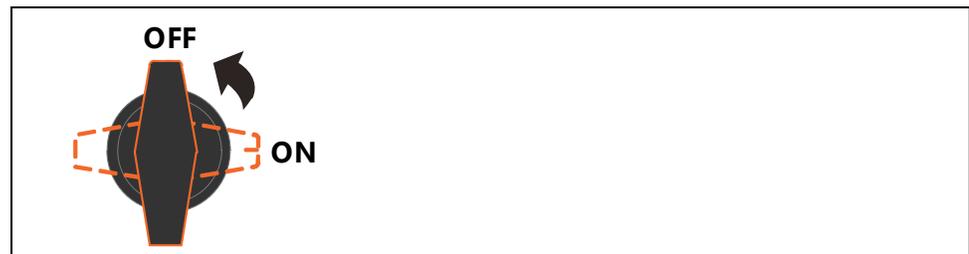
- Pull the cable away from the insulator cap to make sure the cable does not disconnect from the cap.



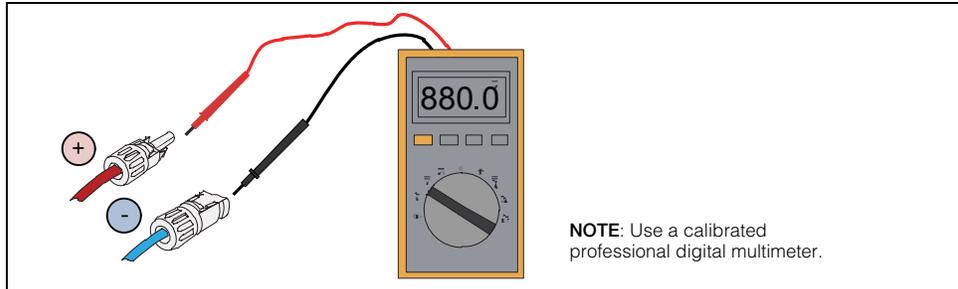
- Tighten the cable gland onto the insulator cap with a torque of 2.5-3 Nm (2 lbf-ft). Use a pair of connector tool spanners, if available.
- Check to make sure the polarities of the PV string's DC cables are correct. The DC cable must match its insulator cap (positive cable = positive insulator cap, negative cable = negative insulator cap).

**NOTE:** The inverter will not function properly if the DC polarities are reversed.

- Turn the CL-60's DC switch to OFF position.



9. Double check the polarity of the DC cables and then check the open-circuit voltage and make sure it does not exceed the inverter's input limit of 1000 V (even under the lowest operating temperature).



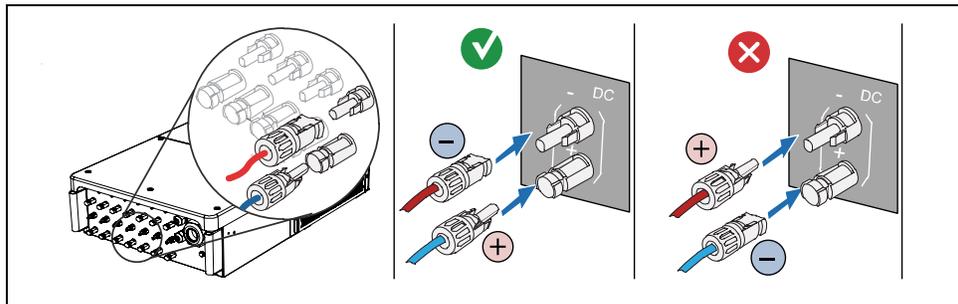
### NOTICE

#### EQUIPMENT DAMAGE

- Check the positive and negative polarity of the PV cells. After confirming the correct polarities, insert the DC connectors into the PV input terminals of the inverter.
- Check every PV array in the string and avoid reversing the polarities.

**Failure to follow these instructions may damage the inverter and other connected equipment.**

10. Insert the positive and negative DC connectors into the PV input terminals on the inverter until a clear clicking sound is heard.



11. Repeat the steps for each PV string in the PV array.
12. Seal the unused DC terminals with waterproof plugs.

**NOTE:** For CL-60E/CL-60JP inverters, use an external 15 A in-line fuse connector (see Figure 3-3 on page 3-21) on the negative line, if required by local installation codes (such as in the UK, France, and Australia). For CL-60A inverters, use a Y-type connector with 15 A in-line fuses (see Figure 3-4 on page 3-21), one in each branch.

**Connectors**

The following are illustrations and product information of the different connectors.



**Figure 3-3** In-line fuse connector

An in-line fuse connector (see Figure 3-3) is available to purchase from Multi-Contact for PV Inverter Inverters. To order, use the following part number:

- Part No.: 55000128-0050UR
- Description: PV-K/ILF 15/6N0050-UR in-line fuse harness



**Figure 3-4** Y-type connectors with in-line 15A fuse

Y-type connectors with in-line 15A fuse (see Figure 3-4) are available from Amphenol ([solar@amphenol-aio.com](mailto:solar@amphenol-aio.com)) for CL-60A Inverters. Use the following part numbers to order:

- H4YY-PV-686077-001
- H4YX-PV-686078-001
- 213015 ASSY-Fuse, 1000V, 15A, CNCTR, M-F

## Grounding the Inverter

### ⚠ WARNING

#### ELECTRIC SHOCK HAZARD

Do not ground either DC positive or negative poles of the PV string. The Conext CL-60 PV Inverter does not isolate the PV from the grid.

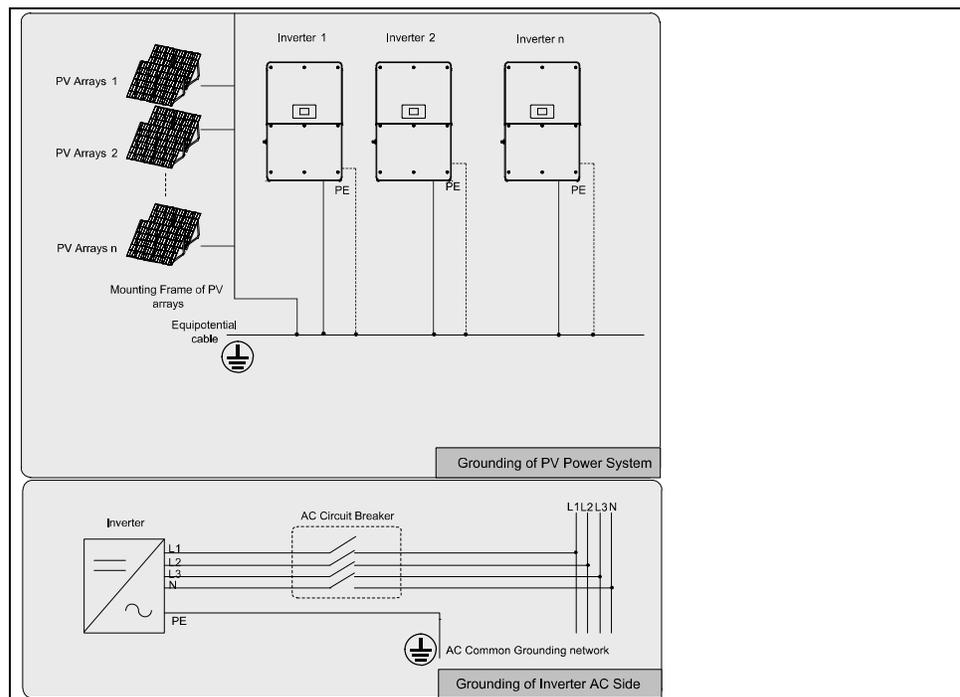
**Failure to follow these instructions can result in death or serious injury.**

### Grounding System Overview

In this PV system, all non-current carrying metal parts and device enclosure should be grounded (such as the PV array frame and the inverter enclosure).

When there is only one inverter in the PV system, the PE cable must be grounded.

When there are multiple inverters in the PV system, they can be grounded at multiple points. Connect the PE cables of all the inverters and the mounting metal frames of the PV array to the equipotential cable (depends on the situation at the site) in order to establish an equipotential connection. See Figure 3-5.



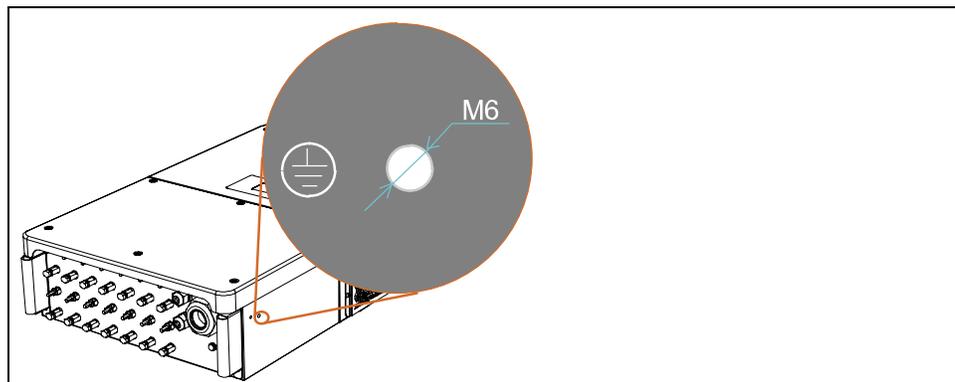
**Figure 3-5** Grounding of Single or Multiple PV Inverters

## Second Protective Earth Terminal

The Conext CL-60 PV Inverter is equipped with a second protective earth (PE) terminal as specified in IEC/EN 62109-1.

### Position of Second PE Terminal

There is a second PE terminal on the right side of the inverter. Perform a PE connection, if necessary.

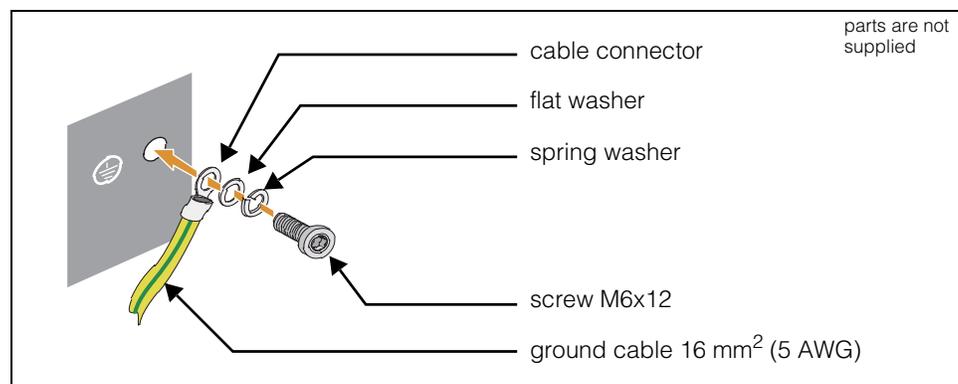


**Figure 3-6** Second PE Terminal

### Cable Connection

To connect a PE cable to the PE terminal:

- ◆ Follow the illustration below.

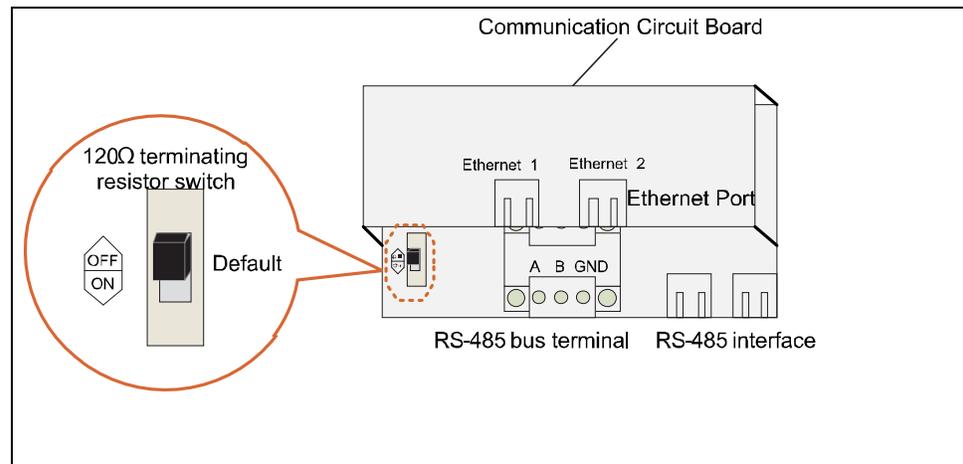


**Figure 3-7** PE Terminal Connection

# Communication Connection

## Overview

The Conext CL-60 PV Inverter has two waterproof communication connection terminals inside the wiring box. There are RS-485 A/B terminals, an RS-485 interface and an Ethernet interface which are provided on the communication circuit board of the wiring box. A  $120\Omega$  terminating resistor can be connected between the A and B communication cable through the dip switch.



**Figure 3-8** Communication Configuration

PV Inverter operational information can be transferred to a local data logging device through an RS-485 or Ethernet-based communication connection using the Conext CL EasyConfig Tool.

**NOTE:** Before proceeding, plan and prepare the correct type of RS-485 communication cables and the RJ45 plug.

The RS-485 cables should be either of these two:

- shielded twisted pair cable
- shielded twisted pair Ethernet cable

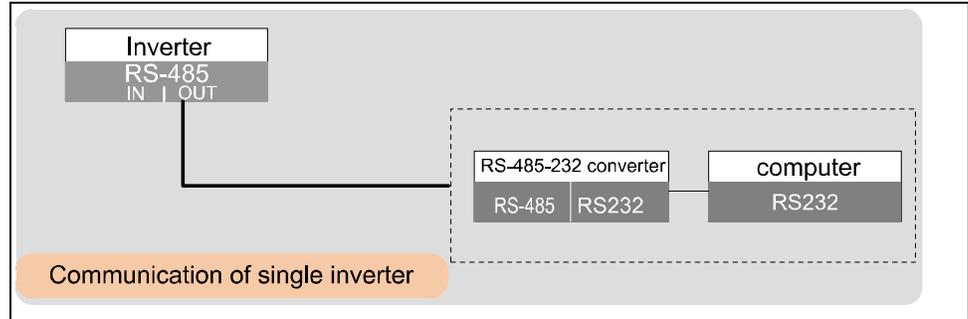
A converter such as the RS-485-232 converter is needed to convert signals between the PV Inverter and the computer.

A network interface is an optional function. Contact <http://solar.schneider-electric.com> for information.

## RS-485 Communication System

**For A Single PV Inverter**

One RS-485 cable is needed for this connection.



**Figure 3-9** RS-485 Single Inverter Connection

**Table 3-4** RS-485 Single Inverter Connection

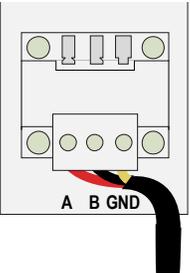
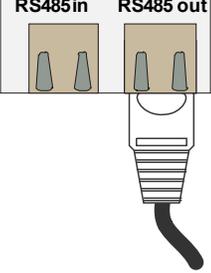
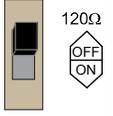
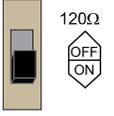
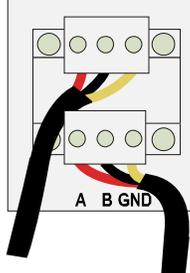
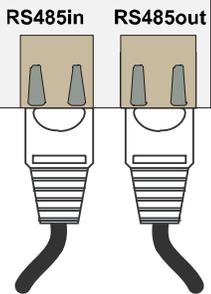
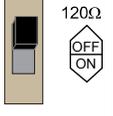
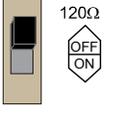
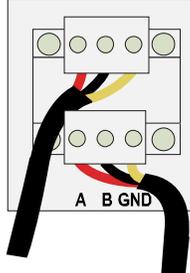
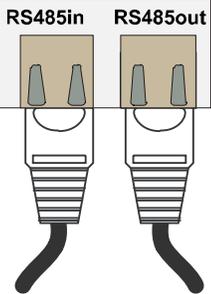
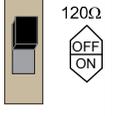
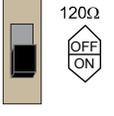
PV Inverter	Communication connection (RS-485 bus connection or RS-485-RJ45 connection)		Terminating Resistor
	RS-485 bus	RJ45	
Single inverter	out only	out only	No

**For Multiple Inverters**

A number of RS-485 cables is needed for multiple connections. A simple formula of  $X = n - 1$ , where  $X$  is the number of RS-485 cables needed and  $n$  is the total number of PV Inverters. The inverters are inter-connected by daisy chain and the first and last inverters in the chain must be terminated with a  $120\Omega$  resistor. The shielding layer of the RS-485 cable should be single-point grounded.

The total length of RS-485 communication cable should be less than 1000 m.

**Table 3-5** RS-485 Multiple Inverter Connections

PV Inverter	Communication connection (RS-485 bus connection or RS-485- RJ45 connection)		Terminating Resistor	
	RS-485 bus	RJ45	$n \leq 15$	$n \geq 15$
Inverter 1	out only 	out only 	No 	Yes 
Inverter 2 to n-1	in and out 	in and out 	No 	No 
Inverter n	in and out 	in and out 	No 	Yes 

**RS-485  
Communication  
Connection**

**To connect an RS-485 cable to the terminal:**

1. Lead and route the network cable through a communication cable gland to the communication circuit board.

**NOTICE**

**INVERTER DAMAGE**

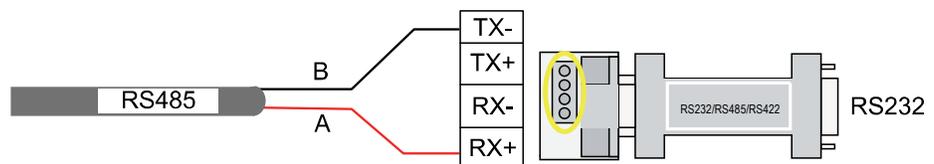
For the CL-60A, acquire and use a NEMA 4/4X-rated conduit hub as required that will fit a 3/4" trade size knockout.

**Failure to follow these instructions may cause leakage and damage to the inverter.**

2. Strip off the insulation layer of the communication cable. Connect the **A**, **B**, and **GND** wires of the RS-485 communication cable to their corresponding terminals which are labeled on the communication circuit board.
3. **Applies to multiple inverters.** Repeat steps 1 and 2 according to the position of the inverter (refer to Table 3-5 on page 3-26). For a single inverter refer only to Table 3-4 on page 3-25.
4. Pull cable/s out gently to make sure they do not disconnect from the terminal.
5. Switch the terminating resistor to ON or OFF, according to the position of the inverter in the case of multiple inverters (refer to Table 3-5 on page 3-26). For a single inverter refer only to Table 3-4 on page 3-25.
6. Tighten the sealing lock to seal off the vacant terminals to prevent dust and moisture from penetrating the inverter.
7. Replace the front cover of the inverter enclosure, if there is no other connection procedures to be done.
8. Connect the other end of the communication cables to their respective devices. Refer to the manuals of 3rd party devices.
9. Confirm that there is a communication connection between the interconnected devices and set the communication parameters.

**NOTE:** If more than one inverter is connected to computer or logging device, set the RS-485 communication parameters from the LCD Display. For more information, see "Communication Parameter Setting" on page 5-38.

**NOTE:** Contact a local Schneider Electric sales representative and order a TeSys TCSMCMNAM3M002P or equivalent.

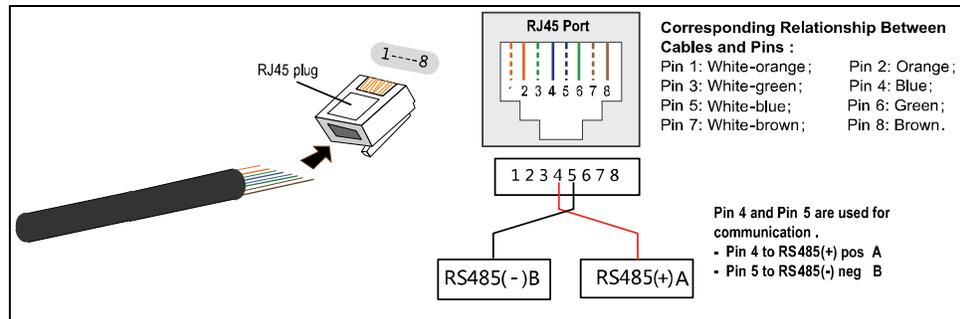


**RJ45-RS-485  
Communication  
Connection**

**To connect an RS-485 RJ45 cable to the ports:**

1. Lead and route the network cable through a communication cable gland to the communication circuit board.
2. Use an Ethernet crimper to crimp the cables and terminate it with an RJ45 plug according to TIA/EIA 568B.

With the Ethernet cable, Pin 4(blue cable) defines the RS-485+ A while Pin 5 (white-blue cable) defines the RS-485- B.

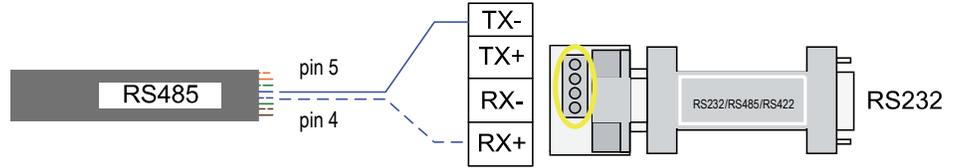


**Figure 3-10** RS-485 RJ45 Pin Wiring Schematic

3. Connect the RJ45 plug into the **RS-485 in/RS-485 out** terminal on the communication circuit board.
4. **Applies to multiple inverters.** Repeat steps 1 to 3 according to the position of the inverter (refer to Table 3-5 on page 3-26) to connect the other RS-485 cables to the **RS-485 out/RS-485 in** terminal. For a single inverter refer only to Table 3-4 on page 3-25.
5. Pull cable/s out gently to make sure they do not disconnect from the terminal.
6. Switch the terminating resistor to ON or OFF, according to the position of the inverter in the case of multiple inverters (refer to Table 3-5 on page 3-26). For a single inverter refer only to Table 3-4 on page 3-25.
7. Tighten the sealing lock to seal off the vacant terminals to prevent dust and moisture from penetrating the inverter.
8. Replace the front cover of the inverter enclosure, if there is no other connection procedures to be done.
9. For the wires which connect to the logging devices, use the Ethernet wire stripper to strip the insulation layer and connect the RS-485 A and B cables to data logging device or RS-485-232 converter. Pin 4 (blue cable) defines RS-485(+) pos A while Pin 5 (white-blue cable) defines RS-485(-) neg B. Refer to the manuals of 3rd party devices.
10. Confirm that there is a communication connection between the interconnected devices and set the communication parameters.

**NOTE:** If more than one inverter is connected to the computer or logging device, set the RS-485 communication parameters from the LCD Display. For more information, see “Communication Parameter Setting” on page 5-38.

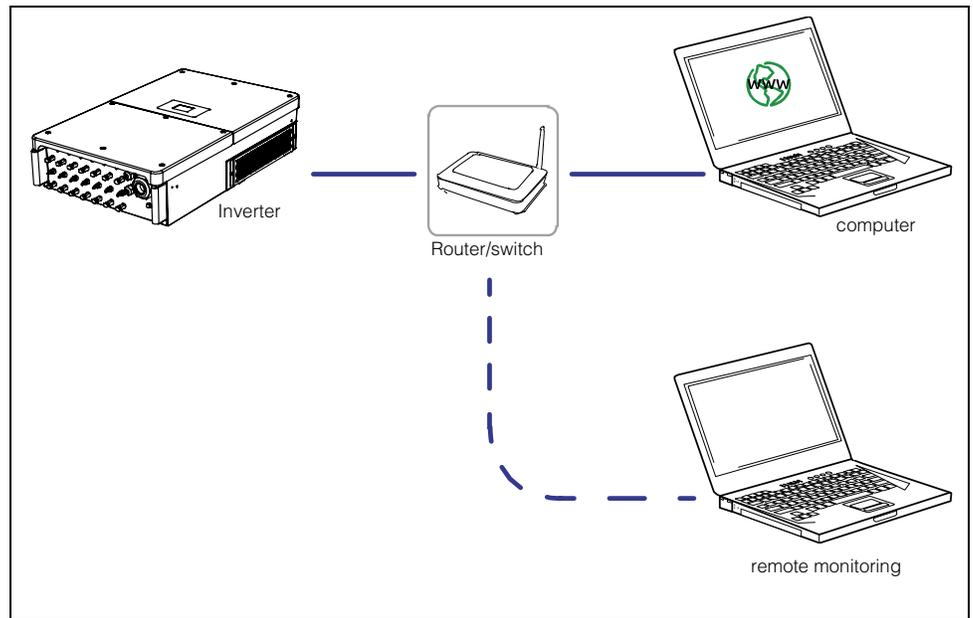
**NOTE:** The CL Easy Config Tool and the RS-485-232 converter are optional parts. You may also purchase a TeSys TCSMCNAM3M002P converter from an authorized Schneider Electric distributor.



## Ethernet Connection

Connect the PV Inverter to a computer through Ethernet network ports. Ethernet communication can be set up as either single, daisy chain, or star topology.

The following illustrations show the various network configurations.



**Figure 3-11** Single PV Inverter Network Connection

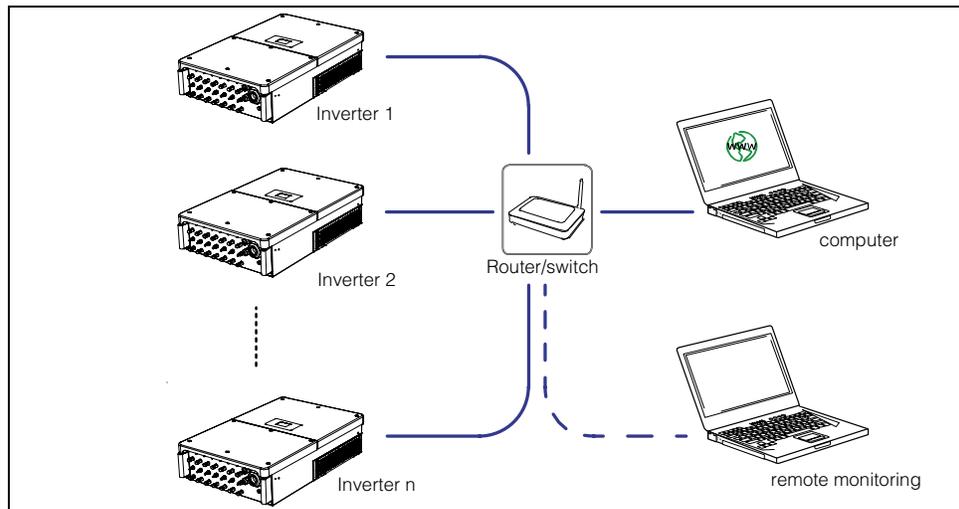


Figure 3-12 Communication Connection in Star Topology

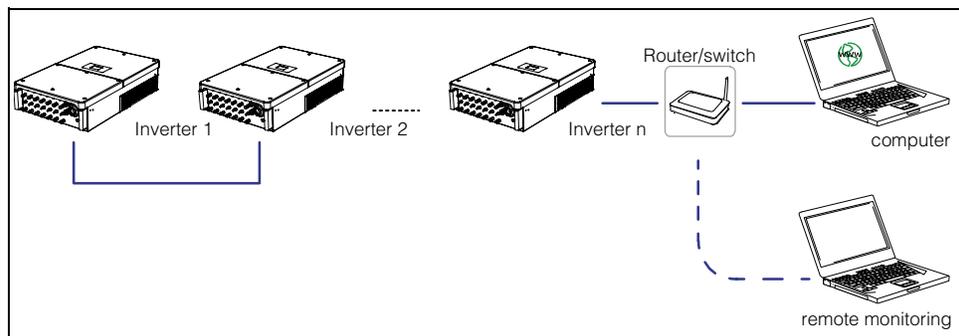


Figure 3-13 Multiple PV Inverters Network Connection in Daisy Chain Topology

**NOTE:** Damage to one device on the daisy chain network can affect communications between all devices on the network.

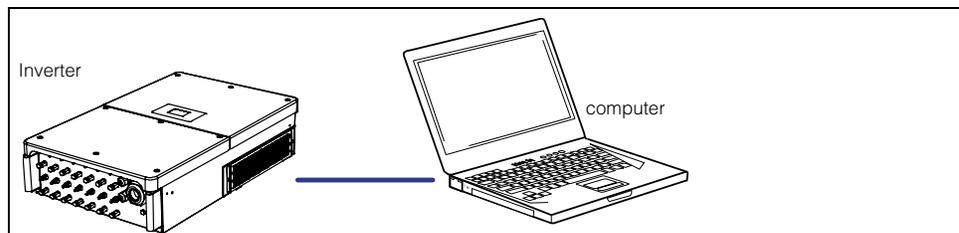
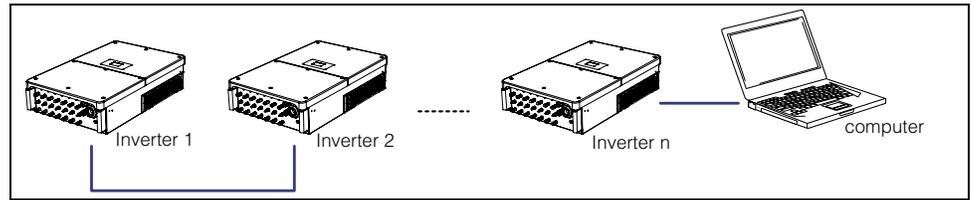


Figure 3-14 Direct Network Connection of a Single PV Inverter



**Figure 3-15** Direct Network Connection of Multiple PV Inverters

**NOTE:** The maximum number of inverters which can be connected in the daisy chain depends on the converter, data logging device, and other factors. Refer to the manual of the converter or data logging device to obtain the manufacturer’s limit number.

The length of each network cable should be less than 100 m.

Only qualified personnel should be allowed to set or change Ethernet connectivity parameters.

**Ethernet Connection Procedure**

**To establish an Ethernet connection:**

1. Lead and route the network cable through a communication cable gland to the communication circuit board.  
Remove or install the communication cable glands at the bottom of the wiring box using the torque guidelines for CL-60E: Torque of 3.5 Nm (~9.2 lbf-ft).

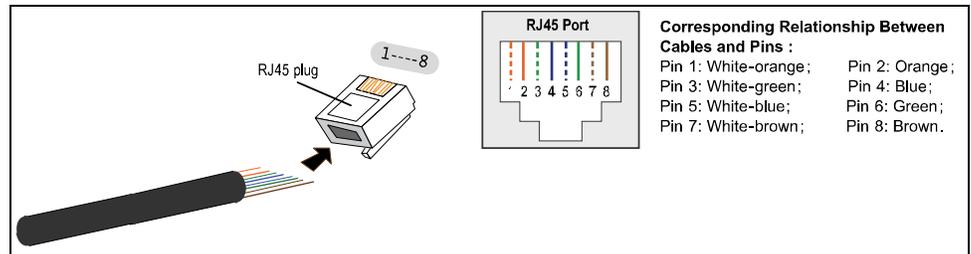
**NOTICE**

**INVERTER DAMAGE**

For the CL-60A, acquire and use a NEMA 4/4X-rated conduit hub as required that will fit a 3/4” trade size knockout.

**Failure to follow these instructions may cause leakage and damage to the inverter.**

2. Use an Ethernet crimper to crimp the cables and terminate it with an RJ45 plug according to TIA/EIA 568B.



**Figure 3-16** Ethernet RJ45 Pin Wiring Schematic

3. Connect the RJ45 plug into the **NET in/NET out** terminal on the communication circuit board.

4. **Applies to multiple inverters.** Repeat steps 1 to 3 according to the position of the inverter (refer to Table 3-5 on page 3-26) to connect the other Ethernet cables to the **NET in/NET out** terminal. For a single inverter refer only to Table 3-4 on page 3-25.
5. Pull cable/s out gently to make sure they do not disconnect from the terminal.
6. Tighten the sealing lock to seal off the vacant terminals to prevent dust and moisture from penetrating the inverter.
7. Replace the front cover of the inverter enclosure, if there is no other connection procedures to be done.
8. For the wires which connect to the logging or switch devices, use the Ethernet wire stripper to strip the insulation layer and terminate the cable with an RJ45 plug and then connect to the other devices. Refer to the manuals of 3rd party devices.
9. Confirm that there is a communication connection between the interconnected devices and set the communication parameters.

---

**NOTE:** If more than one inverter is connected to the computer or logging device, set the Ethernet communication parameters from the LCD Display. For more information, see “Communication Parameter Setting” on page 5-38.

---

# 4

# Commissioning

Chapter 4 contains information about:

- Inspection Before Commissioning
- Commissioning Procedure

## Inspection Before Commissioning

### Check the following before starting the PV Inverter.

- The PV Inverter is accessible for operation, maintenance, and service.
- Check to confirm that the inverter is stable and fixed on the wall/metal frame.
- Check for ventilation.
- Check for and remove any object such as tools and extra screws on top of the PV Inverter.
- Check that the PV Inverter and its accessories are connected securely.
- The cables are routed through the cable glands and protected against potential mechanical damage. Do not overtighten the sealing locks.
- The AC circuit breaker is installed and the cables are properly connected.
- The AC terminals are properly torqued according to recommended torque settings (see “Summary of Torque Values” on page 2–15). Check both top and bottom terminals and adjust accordingly.
- The PV cables with MC4 DC cable connectors (for the CL-60E/CL-60JP) and Amphenol<sup>®</sup> H4 DC cable connectors (for the CL-60A) are properly connected to the DC input terminals of the inverter.
- The terminals which are not being used inside the wiring box are sealed.
- For the CL-60A, check if the communication and AC cable knockouts were installed with NEMA 4/4X-rated conduit hubs as required that will fit a 3/4” trade size and 2” trade size knockouts, respectively.
- The product warning label and rating label are affixed permanently and not peeling off from the product.

## Commissioning Procedure

### Make sure that “Inspection Before Commissioning” is done before operating the inverter.

1. Close (turn On) the AC circuit breaker.
2. Close (turn On) the DC disconnect device from the PV string (or array).
3. Rotate the DC switch to the ON position.
4. Observe the LCD Display.

Suppose there is sufficient sunlight and enough DC power, the PV arrays shall initialize and supply DC power to the PV Inverter.

The LCD Display is activated when DC voltage exceeds the inverter’s startup voltage.

5. Press  to choose the country code. Press  to confirm.

A WARNING message appears.

**NOTE:** Read the warning message and proceed accordingly. Select the country code according to the installation country of the inverter.

Each country code represents corresponding local protective parameters that have been preset before delivery. Before country setting, there is a warning screen.

After setting the country code, proceed with setting other parameters in accordance with the specific requirements of the local grid. Check thoroughly if the set parameters meet the local grid requirement.

## **NOTICE**

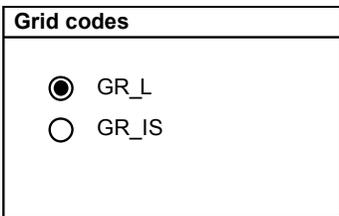
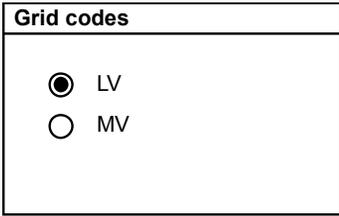
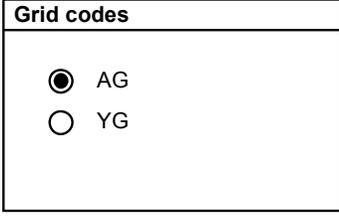
### **EQUIPMENT DAMAGE**

Reset the protection parameters as dictated in “Protection Parameter Setting” on page 5–33 if the country code was not set correctly during commissioning.

**Failure to follow these instructions can result in equipment damage.**

6. Press  to choose the **Grid Code**. Press  to confirm.

Depending on the country code set in the previous step, the grid code screens shall vary. Refer to the table below for information.

Country Code	Grid Code Screen	Description
GR		GR_L = inland Greece GR_IS = island of Greece
DE		LV = low-voltage grid MV = medium-voltage grid
TK		applies to Turkey

Country Code	Grid Code Screen	Description
TH	<div style="border: 1px solid black; padding: 5px;"> <p><b>Grid codes</b></p> <p><input checked="" type="radio"/> 220V</p> <p><input type="radio"/> 230V</p> </div>	applies to Thailand
Other	<div style="border: 1px solid black; padding: 5px;"> <p><b>Grid codes</b></p> <p><input checked="" type="radio"/> 50Hz</p> <p><input type="radio"/> 60Hz</p> </div>	applies to countries with these two grid frequencies

7. Press  to choose the local **Pro-Stage**. Press  to confirm.

Pro-Stage	<div style="border: 1px solid black; padding: 5px;"> <p><b>Pro-Stage</b></p> <p><input checked="" type="radio"/> Single-stage</p> <p><input type="radio"/> Multi-stage</p> </div>	For detailed information, see “Protection Parameter Setting” under “Multi-stage Protection Parameters Explanation” on page 5–36.
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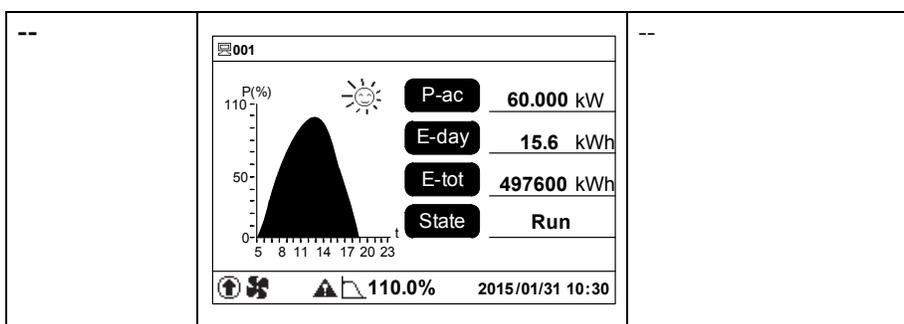
8. Press  to move the cursor and then press  to set the local date and time. Press  to confirm.

Time	<div style="border: 1px solid black; padding: 5px;"> <p><b>Time</b></p> <p>YY/MM/DD</p> <p>Date: 15/01/31</p> <p>Time: 10:06:13</p> </div>	Set the inverter time to local time. Incorrect time setting will affect the data logging.
------	--	---

9. Check and confirm all the settings. Press  to confirm. Press  to exit and reset.

<b>Setting confirmation</b>	<b>Setting confirmation</b>	--
	Countries DE Pro-Stage Single-stage Grid codes LV Date 2015/01/31 Confirm above settings?	

10. Observe the status of the LED indicators and the LCD Main Screen. The PV Inverter now enters into the startup process.



If commissioning succeeds, the **RUN**  LED indicator will light up and **Run** will be displayed on **State**.

If commissioning does not succeed, the **ALERT**  LED indicator will light up and **Fault** will be displayed on the screen. Press  to view **Current Fault** information. Remove the cause of the detected event and then repeat the “Commissioning Procedure”.

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# 5

## LCD Display Operation

Chapter 5 contains information about:

- Description of the Selection Buttons
- Menu Tree
- Main Screen
- Contrast Adjustment
- Checking Running Information
- Checking History Information
- Starting/Stopping
- Password Entry
- System Parameter Setting
- Running Parameter Setting
- Protection Parameter Setting
- Communication Parameter Setting

---

## Description of the Selection Buttons

The CL-60 PV Inverter has two selection buttons for looking up information and configuring the settings (changing the parameters). The two buttons have multiple functions.

Button	Operation	Description
	Press for less than two seconds	Move upwards or downwards or scroll among set values.
	Press for more than two seconds	Return to the previous menu or cancel the command.
	Press for less than two seconds	Move left or right, or turn pages.
	Press for more than two seconds	Enter into the sub-menu or confirm the command.

---

**NOTE:**

- After one minute of no button activity, the LCD backlight turns off.
  - After two minutes of no button activity, the interface system returns to the default screen (the Main Screen).
-

# Menu Tree

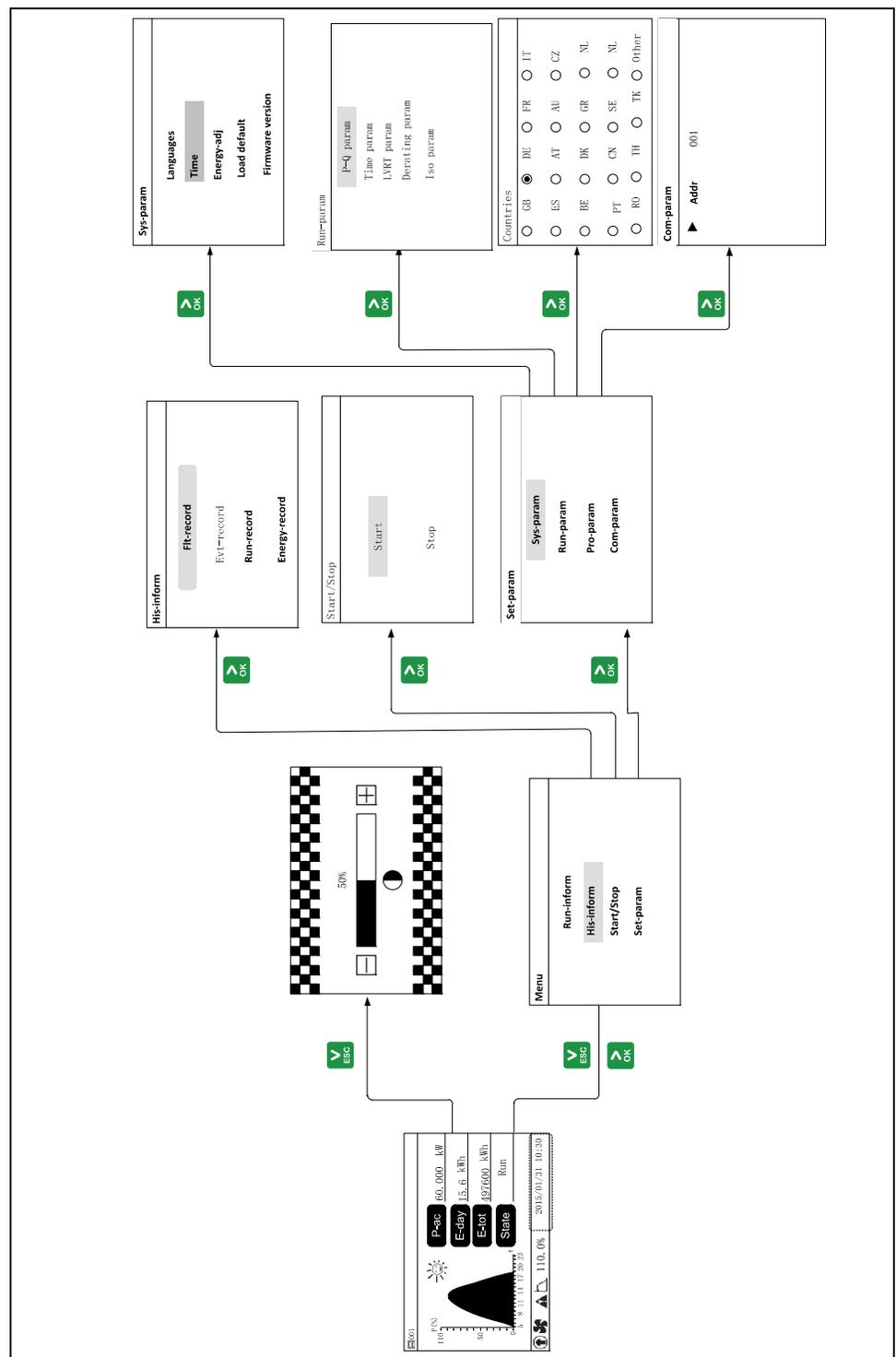
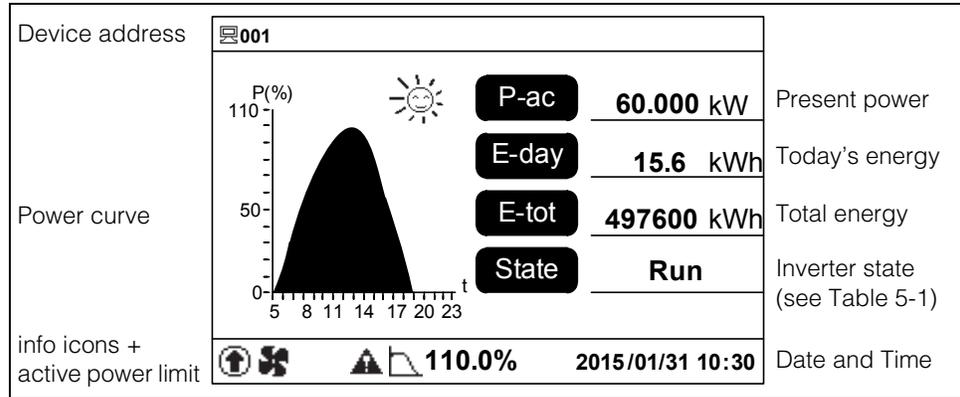


Figure 5-1 Menu Tree

# Main Screen

After commissioning is finished, the LCD Display will show the Main Screen.



**Figure 5-2** Main Screen (Default Screen)

**Table 5-1** Description of the Inverter States

State	Description
<b>Run</b>	After being energized, the inverter tracks the PV arrays' maximum power point (MPP) and converts the DC power into AC power. This is the normal operational mode.
<b>Standby</b>	The inverter enters Standby mode when DC Input is insufficient. In this mode, the inverter will wait within the Standby duration (set by user, see "Main Screen of Run-param" on page 5–18).
<b>Stop</b>	Inverter operation is stopped.
<b>Key-stop</b>	The inverter will stop operation manually via the LCD Menu. In this way, the inverter's internal DSP stops. To restart the inverter, manually start from the LCD Menu.
<b>Start...</b>	The inverter is initializing and synchronizing with the grid.
<b>Upd-fail</b>	Firmware upgrade failure.
<b>Fault</b>	<p>If a ground fault (or any event) is detected, the inverter will automatically stop operation, disconnect the AC relay, and display the ground fault (or event) code on the LCD Display with the <b>ALERT</b>  indicator on.</p> <p>Once the ground fault (or event) is removed in recovery time (to set, see "Main Screen of Run-param" on page 5–18), the inverter will automatically resume running.</p>
<b>Warning</b>	Warning information is detected.
<b>Dispatch</b>	Happens when the inverter's output power is lowered by active control method. This means that the user is selectively reducing output power as opposed to being forced, such as, when derating.

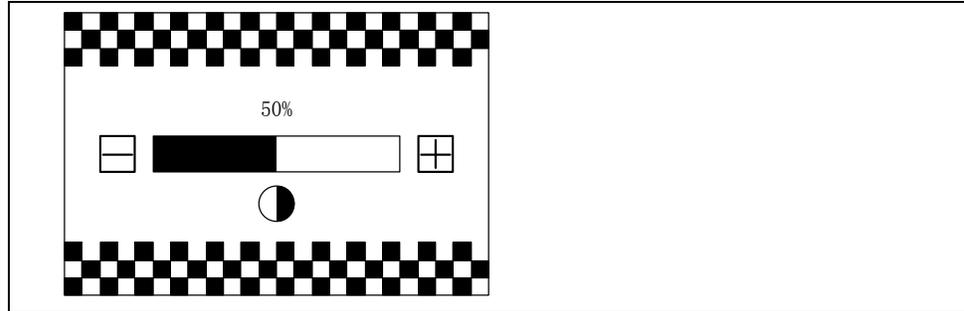
If the inverter detects a ground fault or any event, press  or  to view the event code. To know the meaning of the code, see “LCD Screen” on page 6-4.

**Table 5-2** Info Icons Description

Icon	Description
	Inverter is in firmware update process.
	Inverter in power derating state.
	Fans are operational.
	Inverter is operating in warning state.

# Contrast Adjustment

1. Press  to enter into the contrast adjustment screen.



2. Press  to increase the setting value and press  to decrease the value.
3. Press  to confirm the contrast setting.

**Contrast adjustment range:** 0 to 100%

**Recommended value:** 50% or 60%.

# Checking Running Information

The Main Screen displays some basic information about the inverter. For more detailed information, operate as follows:

**Main Screen (Press  ) -> Menu -> Run-inform (Press  )**

The LCD Display will show the detailed running information.

Scroll pages by pressing  / .

<p><b>DC power input:</b> the total PV input power.</p> <p><b>Vdc[V]:</b> DC voltage of each input.</p> <p><b>Idc[A]:</b> DC current of each input.</p> <p><b>Pdc[W]:</b> DC power of each input.</p>	DC power input      00000W		
	DC		
	Vdc [V]	560.0	
	Idc [A]	10.0	
	Pdc [W]	00000	
<p><b>DC current info:</b> total current for each DC line.</p>	DC-1: 0.00 A	DC-6: 0.00 A	DC- 11: 0.00 A
	DC-2: 0.00 A	DC-7: 0.00 A	DC-12: 0.00 A
	DC-3: 0.00 A	DC-8: 0.00 A	DC-13: 0.00 A
	DC-4: 0.00 A	DC-9: 0.00 A	DC-14: 0.00 A
	DC-5: 0.00 A	DC-10: 0.00 A	

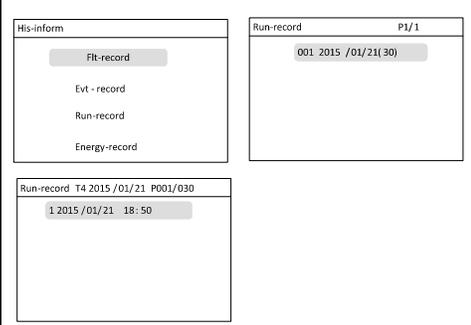
<p><b>Vac[V]</b>: Phase voltage</p> <p><b>Iac[A]</b>: Phase current</p> <p><b>Pac[W]</b>: AC output of each phase</p> <p><b>F[Hz]</b>: Frequency of each phase</p> <p><b>NOTE</b>: CL-60E/CL-60JP models show Line-to-Neutral (L-N) phase voltages.</p> <p>CL-60A models show Line-to-Line (L-L) phase voltages.</p>	<table border="1"> <thead> <tr> <th></th> <th>R</th> <th>S</th> <th>T</th> </tr> </thead> <tbody> <tr> <td>Vac[V]</td> <td>230.0</td> <td>230.0</td> <td>230.0</td> </tr> <tr> <td>Iac[A]</td> <td>6.0</td> <td>6.0</td> <td>6.0</td> </tr> <tr> <td>Pac[W]</td> <td>0000</td> <td>0000</td> <td>0000</td> </tr> <tr> <td>F[Hz}</td> <td>00.00</td> <td>00.00</td> <td>00.00</td> </tr> </tbody> </table>		R	S	T	Vac[V]	230.0	230.0	230.0	Iac[A]	6.0	6.0	6.0	Pac[W]	0000	0000	0000	F[Hz}	00.00	00.00	00.00
		R	S	T																	
Vac[V]	230.0	230.0	230.0																		
Iac[A]	6.0	6.0	6.0																		
Pac[W]	0000	0000	0000																		
F[Hz}	00.00	00.00	00.00																		
<table border="1"> <thead> <tr> <th></th> <th>R-S</th> <th>S-T</th> <th>T-R</th> </tr> </thead> <tbody> <tr> <td>Vac[V]</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <td>Iac[A]</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <td></td> <th>R</th> <th>S</th> <th>T</th> </tr> <tr> <td>F[Hz}</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> </tbody> </table>		R-S	S-T	T-R	Vac[V]	0.0	0.0	0.0	Iac[A]	0.0	0.0	0.0		R	S	T	F[Hz}	0.0	0.0	0.0	
	R-S	S-T	T-R																		
Vac[V]	0.0	0.0	0.0																		
Iac[A]	0.0	0.0	0.0																		
	R	S	T																		
F[Hz}	0.0	0.0	0.0																		
<p><b>CO<sub>2</sub>-reduce</b>: Total CO<sub>2</sub> emission reduction due to the inverter's energy output.</p> <p><b>E-month</b>: Energy generated this month.</p> <p><b>h-Total</b>: Total running hours of the inverter.</p> <p><b>T-today</b>: Inverter running time today.</p> <p><b>Temp</b>: Internal temperature of the inverter.</p> <p><b>ISO</b>: DC string input cable insulation resistance to the ground.</p>	<table border="1"> <tbody> <tr> <td>CO<sub>2</sub>-reduce</td> <td>6kg</td> </tr> <tr> <td>E-month</td> <td>10kWh</td> </tr> <tr> <td>h-Total</td> <td>1h</td> </tr> <tr> <td>T-today</td> <td>63min</td> </tr> <tr> <td>Temp</td> <td>25.0°C</td> </tr> <tr> <td>ISO</td> <td>20000kΩ</td> </tr> </tbody> </table>	CO <sub>2</sub> -reduce	6kg	E-month	10kWh	h-Total	1h	T-today	63min	Temp	25.0°C	ISO	20000kΩ								
CO <sub>2</sub> -reduce	6kg																				
E-month	10kWh																				
h-Total	1h																				
T-today	63min																				
Temp	25.0°C																				
ISO	20000kΩ																				
<p><b>P-W</b>: Inverter output active power.</p> <p><b>S-Va</b>: Inverter output apparent power.</p> <p><b>Country</b>: Inverter selected country code (see "Country Setting" on page 5-33)</p> <p><b>Grid code</b>: Inverter selected grid code (see "Grid Codes" on page 5-35)</p>	<table border="1"> <tbody> <tr> <td>P-W</td> <td>100W</td> </tr> <tr> <td>S-Va</td> <td>130VA</td> </tr> <tr> <td>Country</td> <td>DE</td> </tr> <tr> <td>Grid code</td> <td>LV</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	P-W	100W	S-Va	130VA	Country	DE	Grid code	LV												
P-W	100W																				
S-Va	130VA																				
Country	DE																				
Grid code	LV																				

# Checking History Information

## Checking Running Records

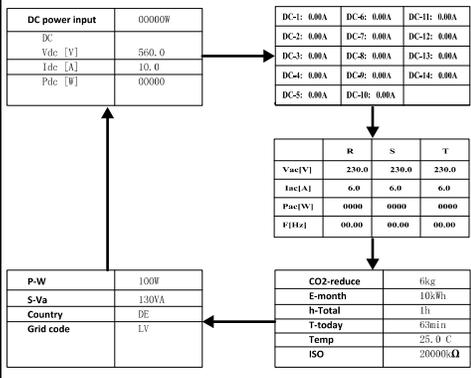
Main Screen (Press ) -> Menu (Press , Press ) -> His-inform  
 (Press  twice, Press ) -> Run-record (Press )

On the **Run-record** screen, scroll pages by pressing , and press  to select the date you want to view. Confirm by pressing .

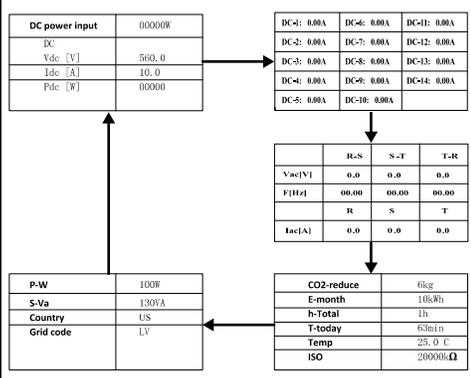


LCD Display shows the running records. Press  to turn pages and press  to view the records of the selected date.

CL-60E/CL-60JP



CL-60A



## Checking Fault (Event) Records

Main Screen (Press ) -> Menu (Press , Press ) -> His-inform  
 (Press ) -> Flt-record (Press )

<p>On the <b>Flt-record</b> screen, scroll pages forward by pressing , and press  to scroll pages backward.</p>	<table border="1"> <tr> <td style="text-align: left;">Flt - record</td> <td style="text-align: center;">P</td> <td style="text-align: right;">1/2</td> </tr> <tr> <td colspan="3">001 2015 /01/31 10 : 16: 10 [ 0008]</td> </tr> <tr> <td colspan="3">002 2015 /01/31 10 : 16: 10 [ 0008]</td> </tr> <tr> <td colspan="3">003 2015 /01/31 10 : 16: 10 [ 0008]</td> </tr> <tr> <td colspan="3">004 2015 /01/31 10 : 16: 10 [ 0008]</td> </tr> <tr> <td colspan="3">005 2015 /01/31 10 : 16: 10 [ 0040]</td> </tr> </table>	Flt - record	P	1/2	001 2015 /01/31 10 : 16: 10 [ 0008]			002 2015 /01/31 10 : 16: 10 [ 0008]			003 2015 /01/31 10 : 16: 10 [ 0008]			004 2015 /01/31 10 : 16: 10 [ 0008]			005 2015 /01/31 10 : 16: 10 [ 0040]		
Flt - record	P	1/2																	
001 2015 /01/31 10 : 16: 10 [ 0008]																			
002 2015 /01/31 10 : 16: 10 [ 0008]																			
003 2015 /01/31 10 : 16: 10 [ 0008]																			
004 2015 /01/31 10 : 16: 10 [ 0008]																			
005 2015 /01/31 10 : 16: 10 [ 0040]																			

**NOTE:** The inverter can only store the 100 most recent fault (event) records.

## Checking History Event Records

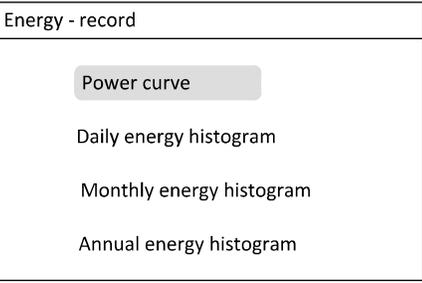
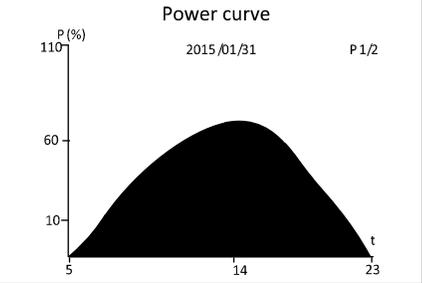
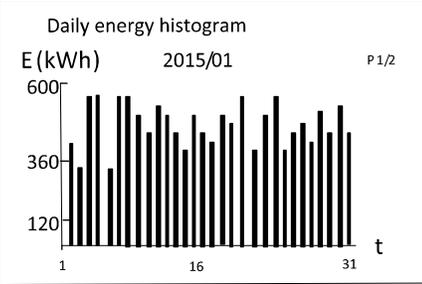
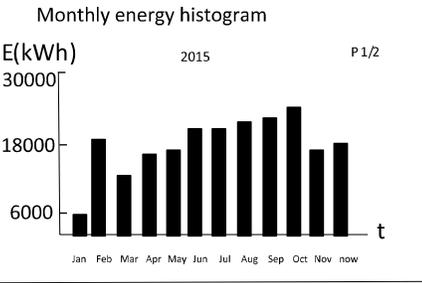
Main Screen (Press ) -> Menu (Press , Press ) -> His-inform  
 (Press , Press ) -> Evt-record (Press )

<p>On the <b>Evt-record</b> screen, scroll pages forward by pressing , and press  to scroll pages backward.</p>	<table border="1"> <tr> <td style="text-align: left;">Evt -record</td> <td style="text-align: center;">P 1/1</td> </tr> <tr> <td colspan="2">001 2015/01/31 10:16:10 Fault</td> </tr> </table>	Evt -record	P 1/1	001 2015/01/31 10:16:10 Fault	
Evt -record	P 1/1				
001 2015/01/31 10:16:10 Fault					

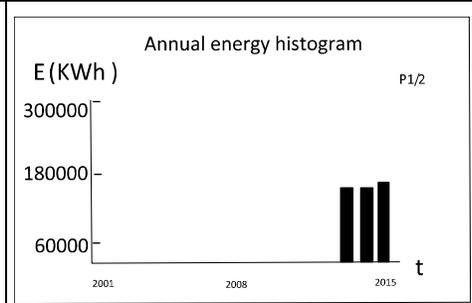
**NOTE:** The inverter can only store the 100 most recent event records.

## Checking Energy Records

Main Screen (Press ) -> Menu (Press , Press ) -> His-inform  
 (Press , Press ) -> Energy-record (Press )

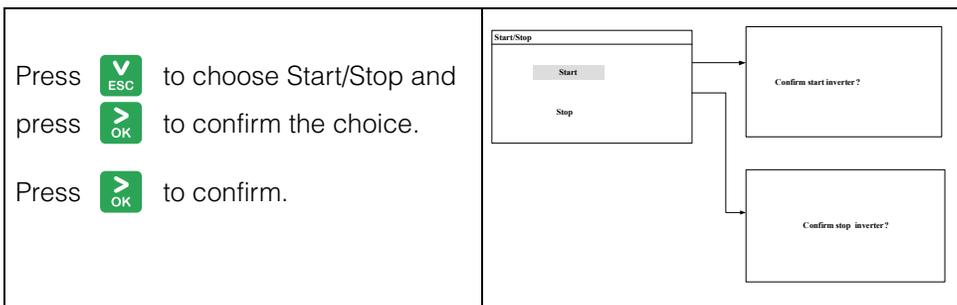
<p>The LCD Display shows the energy records. Press  : to view various energy records such as power curve, daily energy histogram, monthly energy histogram, and annual energy histogram.</p>	
<p><b>Power curve:</b> shows the power output from 5am to 11pm in a single day. Each point in the curve is the percentage of present power and nominal power. Press  or  to view the power curve of the latest 7 days.</p>	
<p><b>Daily energy histogram:</b> shows the power output every day in the current month. Press  or  to view the daily energy of the latest 12 months.</p>	
<p><b>Monthly energy histogram:</b> shows the power output every month in a year. Press  or  to view the monthly energy of the latest 15 years.</p>	

**Annual energy histogram:** shows the power output every year. Press  or  to view the annual energy of the latest 90 years.



## Starting/Stopping

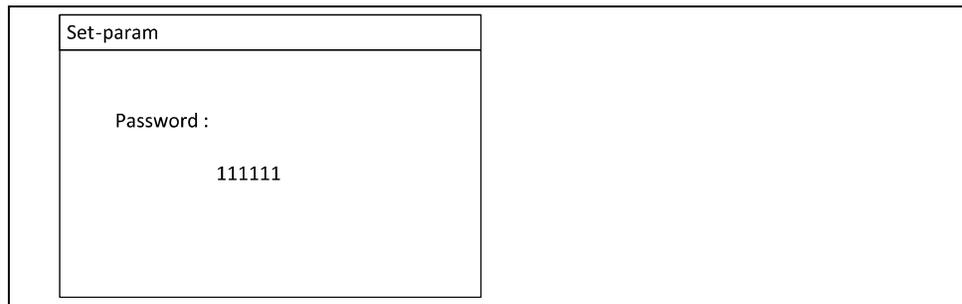
Main Screen (Press ) -> Menu (Press  twice) -> Start/Stop (Press )



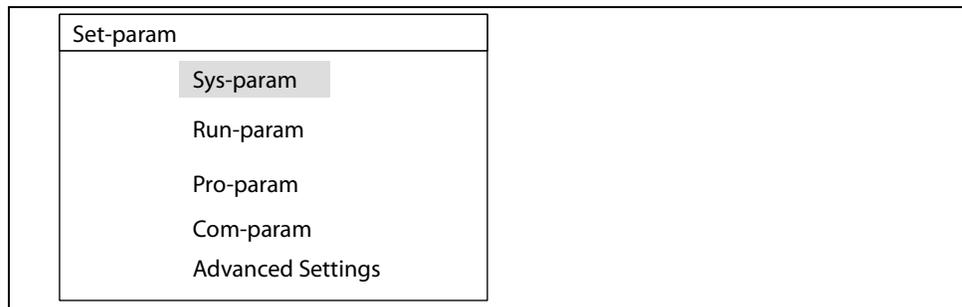
## Password Entry

Parameter setting is password-protected. To set the parameters, you should enter the correct password.

1. Press  to enter the Menu Screen.
2. Press  to move the cursor to **Set-param** and confirm by pressing  .  
A password confirmation screen appears.
3. Press  to move cursor right and press  to input the password 111111.



4. Press  to confirm the password and enter the **Set-param** sub-menu.

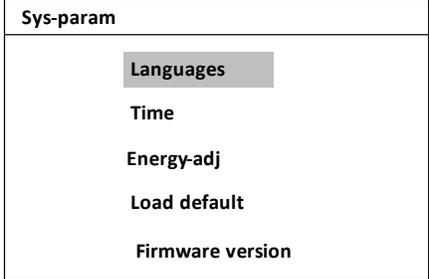
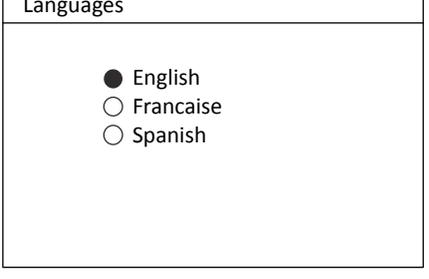


## System Parameter Setting

There are various user-configurable system parameters. Configure the system parameters after entering the correct password.

### Language Setting

Main Screen (Press ) -> Menu (Press  three times) -> Set-param (Press ) -> Enter password (Press ) -> Sys-param (Press ) , Press ) -> Languages (Press )

<p>If <b>Auto</b> is selected for languages, the inverter system language will be the language of the country selected.</p>	 <p><b>Sys-param</b></p> <ul style="list-style-type: none"> <li><b>Languages</b></li> <li><b>Time</b></li> <li><b>Energy-adj</b></li> <li><b>Load default</b></li> <li><b>Firmware version</b></li> </ul>
	 <p><b>Languages</b></p> <ul style="list-style-type: none"> <li><input checked="" type="radio"/> English</li> <li><input type="radio"/> Francaise</li> <li><input type="radio"/> Spanish</li> </ul>

## Time Setting

Incorrect time may cause problems in data logging. Adjust the inverter's time setting according to local time.

Main Screen (Press  ) -> Menu (Press  three times) -> Set-param  
(Press  ) -> Sys-param (Press , Press  ) -> Time (Press  )

<p>Press  to move the cursor and press  to change value. Press  to confirm.</p>	<table border="1"><tr><td data-bbox="925 529 1352 816"><p>Time</p><p>YY /MM /DD</p><p>Date: 15/01/31</p><p>Time : 10:30:55</p></td></tr></table>	<p>Time</p> <p>YY /MM /DD</p> <p>Date: 15/01/31</p> <p>Time : 10:30:55</p>
<p>Time</p> <p>YY /MM /DD</p> <p>Date: 15/01/31</p> <p>Time : 10:30:55</p>		

**NOTE:** If the inverter's internal clock is required to be highly accurate then a separate program may be required to synchronize the internal clock with a network time server.

Contact technical support at: <http://solar.schneider-electric.com/tech-support>, if there is still time deviation after calibration.

---

## Total Energy Deviation Adjustment

If the accumulative value **E-total** in the inverter is different from the value in the external metering device, adjust energy by setting **Energy-adj**.

Main Screen (Press ) -> Menu (Press  three times) -> Set-param  
(Press ) -> Enter Password (Press ) -> Sys-param (Press ) ,  
Press  twice) -> Energy-adj (Press )

Press  to move the cursor and  
press  to change value.

Press  to confirm.

The positive symbol “+” can be  
changed to the negative symbol “-”.

The adjustment range is from -9999 to  
+9999 kWh.

(Energy-adj value)= (Real measured  
value) - (E-tot reading value).

Energy -adj

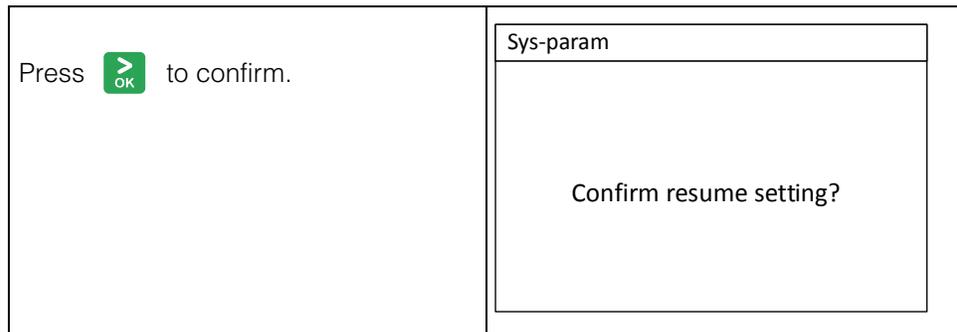
+0000kWh

## Load Default (Factory Reset)

**NOTE:** All historical information will be permanently deleted. All parameters will return to their default values except the protective parameters and time, once the **Load default** operation is performed.

---

Main Screen (Press ) -> Menu (Press  three times) -> Set-param  
(Press ) -> Enter Password (Press ) -> Sys-param (Press ) ,  
Press  three times) -> Load Default (Press )



## Checking Firmware Version

Main Screen (Press  ) -> Menu (Press  three times) -> Set-param  
 (Press  ) -> Enter Password (Press  ) -> Sys-param (Press  ,  
 Press  four times) -> Firmware version (Press  )

Inverter shows detailed firmware information, including LCD version and DSP version.

The firmware version information is read-only.

CL-60E

CL-60A

### Firmware version

Device Type: CL-60E

SN: A1612160390

Ver:

MDSP\_CL-60E\_V11\_V1\_E

LCD\_CL-60E\_V11\_V03\_U\_M

### Firmware version

Device Type: CL-60A

SN: A1608180127

Ver:

MDSP\_CL-60A\_V11\_V1\_D

LCD\_CL-60A\_V11\_V03\_S\_M

# Running Parameter Setting

## Main Screen of Run-param

Main Screen (Press  ) -> Menu (Press  three times) -> Set-param  
 (Press  ) -> Enter Password (Press  ) -> Sys-param (Press  ,  
 Press  ) -> Run-param (Press  )

<p>On the <b>Run-param</b> screen, press  to select one item and press  to enter the setting interface.</p> <p>For each item, Press  to move the cursor and press  to set the appropriate value.</p> <p>Press  to confirm.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>Run-param</p> <ul style="list-style-type: none"> <li><b>P- Q param</b></li> <li>Time param</li> <li>Derating param</li> <li>Iso param</li> <li>LVRT param</li> <li>MPPT Scan</li> <li>Altitude</li> </ul> <p><b>NOTE:</b> The Run-param screen varies depending on the selected country. In this example, the country selected is Italy.</p> </div>
---	---

**NOTE:** The Run-param screen varies depending on the selected country. The following screens in the table are for reference only.

**Table 5-3** Description of Running Parameters

Parameter		Description	Default	Range
P-Q param	<b>P-W limits</b>	Inverter active power limitation	110.0%	0 to 110%
	<b>Rate limit</b>	Set the active power change rate. When it is set to ON, the rate can be raised or lowered (decline).	OFF	OFF/ ON
	<b>Power raise</b>	When Rate limit is ON, set the active power rise rate.	100%/min	8 to 100%/min
	<b>Power Decline</b>	When Rate limit is ON, set the active power decline rate.	6000%/min	8 to 6000%/min
	<b>Fault slowup</b>	Set the power rise rate when a fault is removed. When it is ON, the active power raise rate can be set.	ON	OFF/ ON
	<b>Slowup rate</b>	Set the active power raise rate.	100%/min	8 to 100%/min
	<b>Save P-W Setting</b>	Set whether to save the active power setting.	OFF	OFF/ ON
	<b>Save Q-Var setting</b>	Set whether to save the reactive power setting.	ON	[Pt] / [Qt] / [Off] / [Q(P)] / [Q(U)] / ON

**Table 5-3** Description of Running Parameters

Parameter		Description	Default	Range
P-Q param	Q-Var switch	Set the reactive power regulation function.	OFF	OFF/ ON
	PF	Inverter output power factor	+1.000	-1.000 to -0.800/ +0.800 to +1.000
	Q-Var limits	Inverter reactive power limitation	0.0%	0 to +100%/ 0 to -100%
Time param	Standby time	Time from inverter Standby to Startup	20s	20 to 255s
	Recover time	Time from when inverter fault is removed to Standby	30s [IT: 300s]	0-900s
Derating param		Set the Derating param to OFF or ON. If it is ON, the inverter will operate with power derating when grid frequency exceeds the set value.	OFF	OFF/ ON

**Table 5-3** Description of Running Parameters

Parameter		Description	Default	Range
Iso param	ISO	Set the ISO protection function to ON or OFF. When it is ON, the inverter will not connect to the grid when resistance to the ground is below the set value.	ON	OFF/ ON
	ISO pro value	Set the resistance to the ground.	100K $\Omega$	-
LVRT param		Set the LVRT to OFF or ON. When it is ON, the inverter can keep the grid connection for a certain time from when grid fault occurs and provide reactive power for grid recovery.	OFF	OFF/ ON
MPPT scan		Set to either manual or interval scan.	Manual	Manual/ Interval
Altitude		Set to the inverter's operating altitude.	3000 m	up to 4000 m, derating at > 3000 m

## Active/Reactive Power Parameters

Main Screen (Press ) -> Menu (Press  three times) -> Set-param  
 (Press ) -> Enter Password (Press , Press ) -> Run-param  
 (Press ) -> P-Q param (Press )

<p>P-Q Param</p> <ul style="list-style-type: none"> <li>▶ P-W limits      110.0%</li> <li>Rate limit      [OFF]</li> <li>Power raise      100%/min</li> <li>Power decline   6000%/min</li> <li>Fault slowup    [OFF]</li> <li>Slowup rate     100%/min</li> </ul>	<p>P-Q param</p> <ul style="list-style-type: none"> <li>▶ Q-Var switch    [OFF ]</li> <li>PF                +1.000</li> <li>Q-Var limits    +100.0%</li> </ul>
<p>P-Q param</p> <ul style="list-style-type: none"> <li>▶ Save P-W setting    [OFF]</li> <li>Save Q-Var setting    [ON]</li> </ul>	

## Reactive Power Regulation

Inverter provides reactive power regulation function. Use the **Q-Var switch** parameter to activate this function and select proper regulation mode.

**Table 5-4** Explanation of Reactive Power Regulation Switch

Regulation Mode	Explanation
Pf	The reactive power can be regulated by the parameter PF (Power Factor).
Qt	The reactive power can be regulated by the parameter Q-Var limits (in %).
Off	The PF is limited to +1.000, and the "Q-Var limits" is limited to 0.0%.
Q(P)	The PF changes with the output power of the inverter.
Q(U)	The reactive power changes with the grid voltage.

### Pf Mode

The reactive power can be regulated by the parameter **PF** on the **Run-param** screen.

### Qt Mode

The reactive power can be regulated by the parameter **Q-Var limits** (in %) on the **Run-param** screen.

### Off Mode

Reactive power cannot be regulated. The **PF** is limited to **+1.000**, and the **Q-Var** limit is limited to **0.0%**.

### Q(P) Mode (when the country selection is not “IT”)

<p><b>PF</b> changes with the inverter output power.</p> <p>If the country selection is not <b>IT</b> (Italy), after selecting <b>Q(P) Mode</b>, Press  to enter the <b>Run-param-Q(P)</b> submenu.</p> <p>For each item, Press  to move the cursor and press  to set the appropriate value.</p> <p>Press  to confirm.</p>	<table border="1"> <thead> <tr> <th colspan="2">Run-param-Q(P)</th> </tr> </thead> <tbody> <tr> <td>▶ Upper PF Cap</td> <td>1.000</td> </tr> <tr> <td>Lower Power</td> <td>050.0%</td> </tr> <tr> <td>Lower PF Ind</td> <td>0.900</td> </tr> <tr> <td>Upper Power</td> <td>100.0%</td> </tr> </tbody> </table>	Run-param-Q(P)		▶ Upper PF Cap	1.000	Lower Power	050.0%	Lower PF Ind	0.900	Upper Power	100.0%
Run-param-Q(P)											
▶ Upper PF Cap	1.000										
Lower Power	050.0%										
Lower PF Ind	0.900										
Upper Power	100.0%										

**Table 5-5** Q(P) Mode Parameters Explanation

Parameter	Explanation	Default	Range
<b>Upper PF Cap</b>	Power factor of point P1 in the Q(P) mode curve	1	0.9 to 1
<b>Lower Power<sup>a</sup></b>	Output power of point P1 in the Q(P) mode curve (in %)	50%	0% to 50%
<b>Lower PF Ind</b>	Power factor of point P2 in the Q(P) mode curve	0.9	0.9 to 1
<b>Upper Power<sup>a</sup></b>	Output power of point P2 in the Q(P) mode curve (in %)	100%	50% to 100%

a.Lower Power < Upper Power

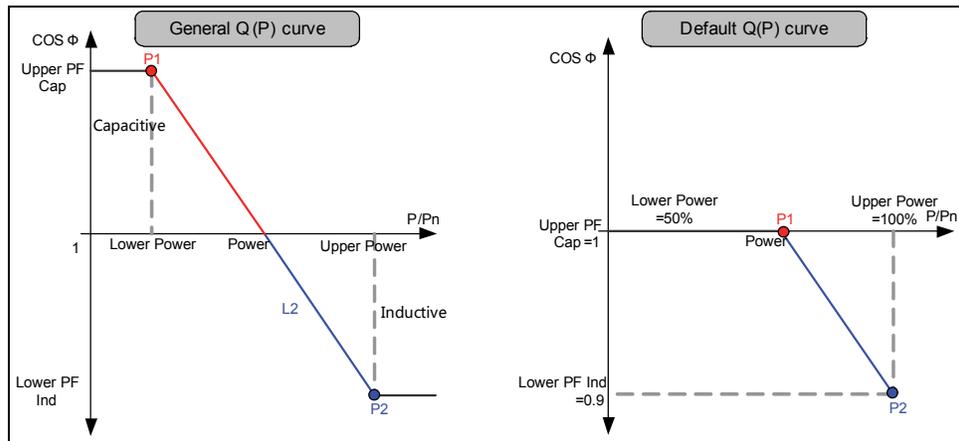


Figure 5-3 Reactive Power Regulation Curve in Q(P) Mode

**Q(U) Mode (when the country selection is not “IT”)**

The reactive power ratio changes with the grid voltage.

If the country selection is not **IT** (Italy), after selecting **Q(U) Mode**, Press  to enter the **Run-param-Q(U)** submenu.

For each item, Press  to move the cursor and press  to set the appropriate value.

Press  to confirm.

Run-param-Q(U)		
▶ Lower Q/Sn Ind		050.0%
Upper Q/Sn Cap		050.0%
Lower U Limit		095.0%
Upper U Limit		115.0%

Run-param-Q(U)		
▶ U1 Limit		095.0%
U2 Limit		105.0%
Hysteresis		3.0%

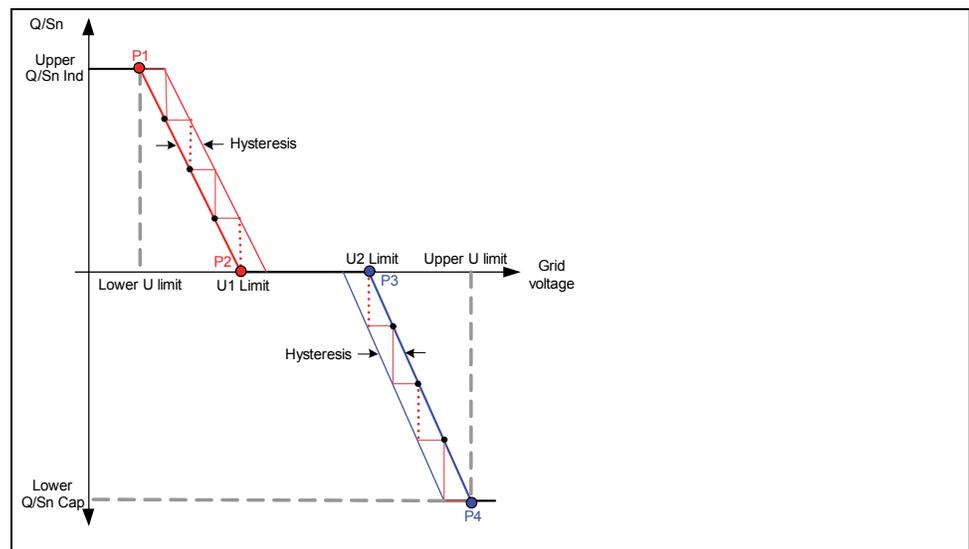
Table 5-6 Q(U) Mode Parameters Explanation

Parameter	Explanation	Default	Range
Lower Q/Sn Ind	Inductive Q/Sn value of point P4 in the Q(U) mode curve	25%	0% to 50%
Upper Q/Sn Cap	Capacitive Q/Sn value of point P1 in the Q(U) mode curve	25%	0% to 50%

**Table 5-6** Q(U) Mode Parameters Explanation

Parameter	Explanation	Default	Range
<b>Lower U Limit</b>	Grid voltage limit (in %) of point P1 in the Q(U) mode curve	80%	80% to 90%
<b>Upper U Limit</b>	Grid voltage limit (in %) of point P4 in the Q(U) mode curve	115%	110% to 115%
<b>U1 Limit<sup>a</sup></b>	Grid voltage limit (in %) of point P2 in the Q(U) mode curve	95%	95% to 100%
<b>U2 Limit<sup>a</sup></b>	Grid voltage limit (in %) of point P3 in the Q(U) mode curve	105%	100% to 105%
<b>Hysteresis<sup>a</sup></b>	Hysteresis voltage width (in %)	3%	0% to 5%

a.U1 Limit + Hysteresis < U2 Limit - Hysteresis



**Figure 5-4** Reactive Power Regulation Curve in Q(U) Mode

## Reactive Power Setting for Italy

If the **Country** selected is **IT** (Italy), several LCD Menus and operation methods are different especially **Run-param**.

### Italy Q(P) Mode

<p>Power factor changes with the output power of the inverter.</p> <p>Select <b>Q(P) mode</b> and Press  to enter into the <b>Run-para-Q(P)</b> sub-menu.</p> <p>Press  to move the cursor; Press  to enter the editing mode, then the selected parameter will be shaded.</p> <p>Press  to increase one-step value; Press  to decrease one-step value.</p> <p>Press  to confirm the setting and exit from the editing mode.</p>	<table border="1"> <thead> <tr> <th colspan="2">Run- param- Q ( P )</th> <th style="text-align: right;">P3/3</th> </tr> </thead> <tbody> <tr> <td>▶ PA</td> <td></td> <td style="text-align: right;">020. 0%</td> </tr> <tr> <td>PB</td> <td></td> <td style="text-align: right;">050. 0%</td> </tr> <tr> <td>PC</td> <td></td> <td style="text-align: right;">100. 0%</td> </tr> <tr> <td>Pf max</td> <td></td> <td style="text-align: right;">0. 900</td> </tr> <tr> <td>Uin</td> <td></td> <td style="text-align: right;">105. 0%</td> </tr> <tr> <td>Uout</td> <td></td> <td style="text-align: right;">100. 0%</td> </tr> </tbody> </table>	Run- param- Q ( P )		P3/3	▶ PA		020. 0%	PB		050. 0%	PC		100. 0%	Pf max		0. 900	Uin		105. 0%	Uout		100. 0%
Run- param- Q ( P )		P3/3																				
▶ PA		020. 0%																				
PB		050. 0%																				
PC		100. 0%																				
Pf max		0. 900																				
Uin		105. 0%																				
Uout		100. 0%																				

**Table 5-7** Italy Q(P) Mode Parameters Explanation

Parameter	Explanation	Default	Range	Step
<b>PA<sup>a</sup></b>	Active power at point A (in %)	20%	20 to 100%	1%
<b>PB<sup>a</sup></b>	Active power at point B (in %)	50%	20 to 100%	1%
<b>PC<sup>a</sup></b>	Active power at point C (in %)	100%	20 to 100%	1%
<b>Pf max</b>	Power factor at point C	0.9	0.9 to 1	0.01
<b>Uin<sup>b</sup></b>	Enter Q(P) regulation mode when grid voltage is above Uin	105%	100 to 110%	1%
<b>Uout<sup>b</sup></b>	Exit from the Q(P) regulation mode when grid voltage is below Uout	100%	90 to 100%	1%

a. PA < PB ≤ PC  
b. Uin > Uout

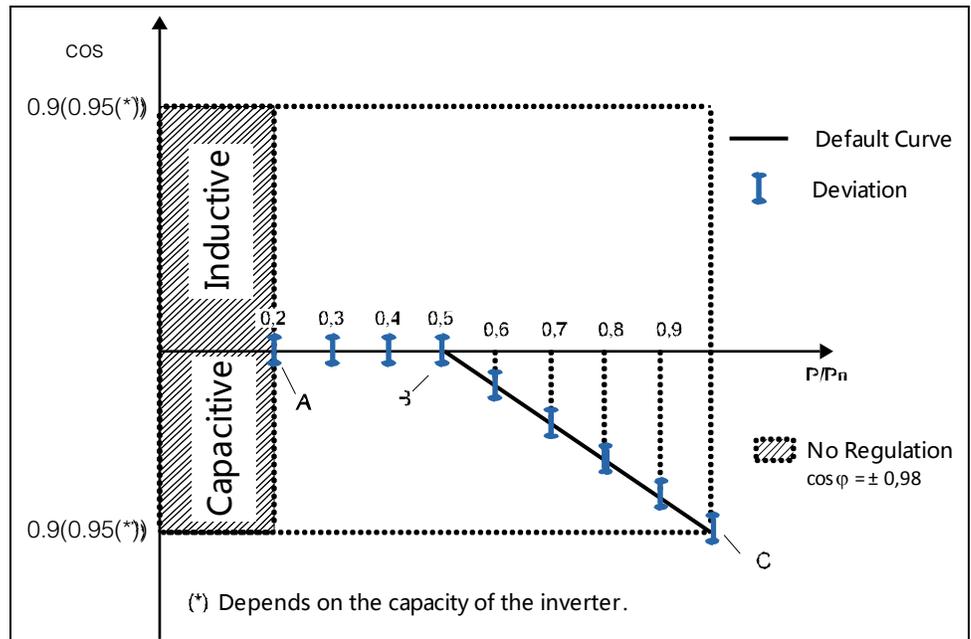


Figure 5-5 Reactive Power Regulation Curve in IT Q(P) Mode

### Italy Q(U) Mode

The reactive power ratio changes with the grid voltage.

Select **Q(U) mode** and Press  to enter into the **Run-para-Q(U)** sub-menu.

Press  to move the cursor; Press  to enter the editing mode, then the selected parameter will be shaded.

Press  to increase one-step value; Press  to decrease one-step value.

Press  to confirm the setting and exit from the editing mode.

Run- param- Q (U) P3/4	
▶ V2i	090. 0%
V1i	092. 0%
V1s	108. 0%
V2s	110. 0%
Qmax	100. 0%
Pin	020. 0%

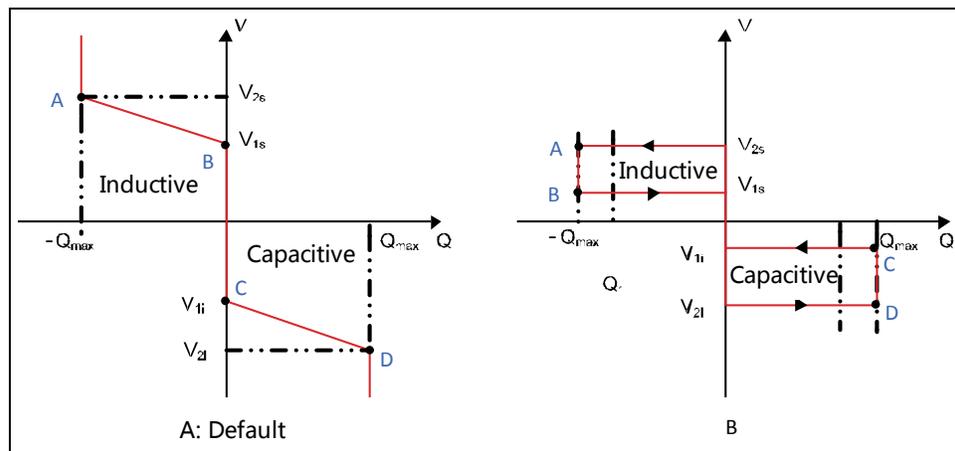
↓

Run- param- Q (U) P4/4	
Pout	009. 0%
▶ Curve	[ A ] ▲▼

**Table 5-8** Italy Q(U) Mode Parameters Explanation

Parameter	Explanation	Default	Range	Step
V2i <sup>a</sup>	Grid voltage at point D (in %)	90%	90 to 110%	1%
V1i <sup>a</sup>	Grid voltage at point C (in %)	92%	90 to 110%	1%
V2s <sup>a</sup>	Grid voltage at point A (in %)	108%	90 to 110%	1%
V1s <sup>a</sup>	Grid voltage at point B (in %)	110%	90 to 110%	1%
Qmax	The max. ratio of reactive power (in %)	90%	50 to 100%	1%
Pin <sup>b</sup>	Enter the Q(U) regulation mode when power is above Pin	20%	20 to 100%	1%
Pout <sup>b</sup>	Exit from the Q(U) regulation mode when power is below Pout	9%	1 to 20%	1%
Curve	Curve type	A	A/B	-

a.  $V2i < V1i < V1s < V2s$   
 b.  $Pin > Pout$



**Figure 5-6** Reference Reactive Power Regulation Curve in IT Q(U) Mode

## Save P/Q-set

<p>On the Save P/Q-set screen, press  to move the arrow to one item.</p> <p>Press  to move the cursor and</p> <p>Press  to set.</p> <p>Press  to confirm.</p> <p>Select <b>ON</b> to save the values set after power down.</p> <p>Select <b>OFF</b> to restore default values after power down.</p>	<table border="1"> <tr> <td colspan="2">P- Q param</td> </tr> <tr> <td>▶ Save P-W setting</td> <td>[OFF]</td> </tr> <tr> <td>Save Q-Var setting</td> <td>[ON]</td> </tr> </table>	P- Q param		▶ Save P-W setting	[OFF]	Save Q-Var setting	[ON]
P- Q param							
▶ Save P-W setting	[OFF]						
Save Q-Var setting	[ON]						

## Time Parameters

Main Screen (Press  ) -> Menu (Press  three times) -> Set-param (Press  ) -> Enter password (Press  , Press  ) -> Run-param (Press  , Press  twice) -> Time-param (Press  )

<table border="1"> <tr> <td colspan="2">Time -param</td> </tr> <tr> <td>Standby time</td> <td>020s</td> </tr> <tr> <td>Recovery time</td> <td>030s</td> </tr> </table> <p>CL-60E/CL-60JP</p>	Time -param		Standby time	020s	Recovery time	030s	<table border="1"> <tr> <td colspan="2">Time -param</td> </tr> <tr> <td>Standby time</td> <td>020s</td> </tr> <tr> <td>Recovery time</td> <td>300s</td> </tr> </table> <p>CL-60A</p>	Time -param		Standby time	020s	Recovery time	300s
Time -param													
Standby time	020s												
Recovery time	030s												
Time -param													
Standby time	020s												
Recovery time	300s												

## Derating Parameters

Main Screen (Press ) -> Menu (Press  three times) -> Set-param (Press ) -> Enter password (Press , Press ) -> Run-param (Press , Press  three times) -> Derating param (Press )

Derating param	
▶ Fre-Derating	[ON/OFF]
F1	50.00 Hz
P1	100 %
F2	50.20 Hz
P2	100 %
F3	52.00 Hz
P3	100 %

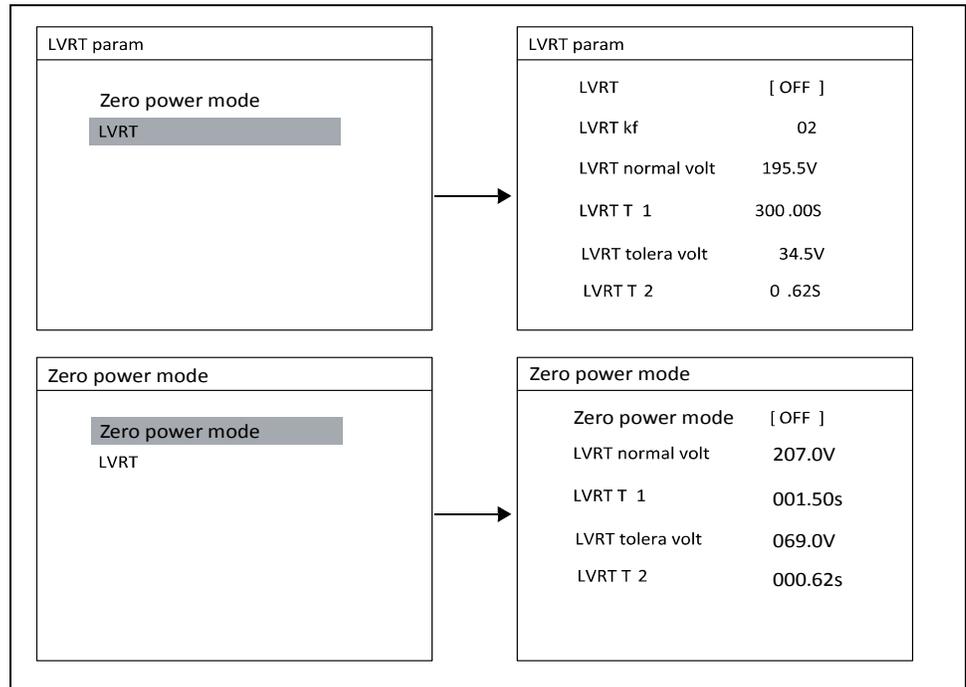
## ISO Parameters

Main Screen (Press ) -> Menu (Press  three times) -> Set-param (Press ) -> Enter password (Press , Press ) -> Run-param (Press , four times) -> ISO param (Press )

ISO param	
▶ ISO	[ON/OFF]
ISO pro value	100kΩ

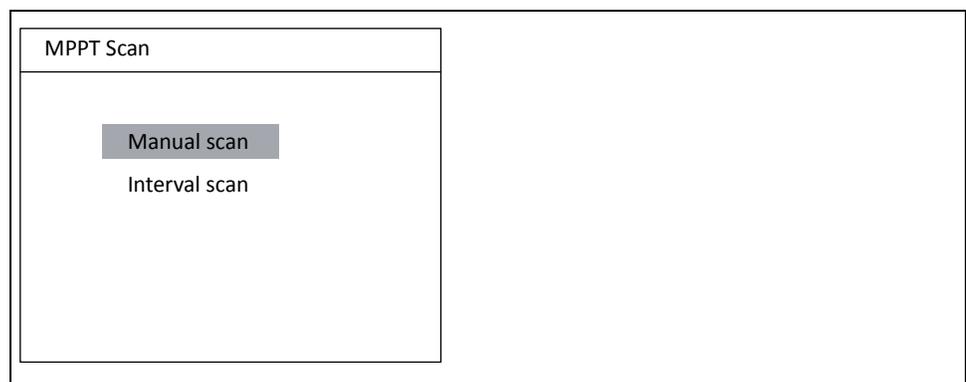
## LVRT Parameter

Main Screen (Press ) -> Menu (Press  three times) -> Set-param (Press ) -> Enter password (Press , Press ) -> Run-param (Press , Press  five times) -> LVRT param (Press )



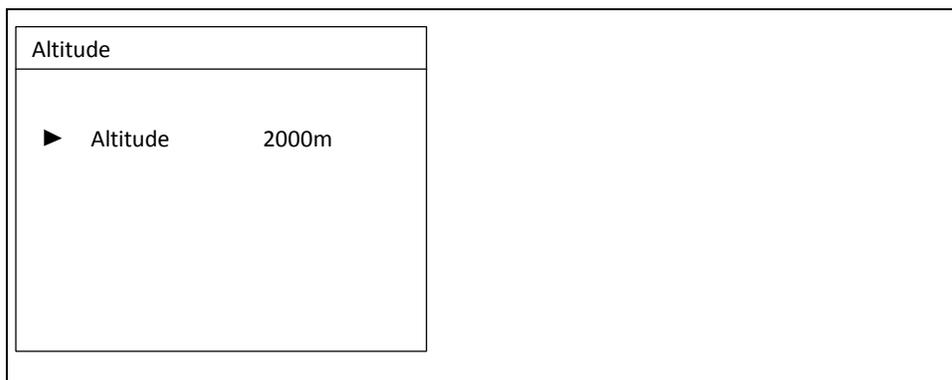
## MPPT Scan Parameter

Main Screen (Press ) -> Menu (Press  three times) -> Set-param (Press ) -> Enter password (Press , Press ) -> Run-param (Press , six times) -> MPPT Scan (Press )



## Altitude Parameter

Main Screen (Press  OK ) -> Menu (Press  ESC three times) -> Set-param (Press  OK ) -> Enter password (Press  OK , Press  ESC ) -> Run-param (Press  OK seven times) -> Altitude (Press  OK )



## Protection Parameter Setting

Protection parameters are designed for the threshold value that can trigger the protection function of the inverter.

Main Screen (Press  ) -> Menu (Press  three times) -> Set-param (Press  ) -> Enter password (Press , Press  twice) -> Protection Parameter (Press  )

Press  to move cursor and Press  to enter the password.

**NOTE:** The user can only check the parameter in this screen. The default values of the protection parameters have been preset as per grid code of the corresponding country.

To set the protection parameter, use the password: 111111

## Country Setting

To make the protection parameters setting convenient, the inverter provides built-in protection parameters for certain countries.

Press  to choose the country and press  to confirm.

If the country selected is not in the list, choose **Other** and then input the protection parameters manually.

CL-60E/CL-60JP

CL-60A

### Countries

- |                             |                                     |                          |                          |
|-----------------------------|-------------------------------------|--------------------------|--------------------------|
| <input type="radio"/> GB    | <input checked="" type="radio"/> DE | <input type="radio"/> FR | <input type="radio"/> IT |
| <input type="radio"/> ES    | <input type="radio"/> AT            | <input type="radio"/> AU | <input type="radio"/> CZ |
| <input type="radio"/> BE    | <input type="radio"/> DK            | <input type="radio"/> GR | <input type="radio"/> NL |
| <input type="radio"/> PT    | <input type="radio"/> CN            | <input type="radio"/> SE | <input type="radio"/> RO |
| <input type="radio"/> RO    | <input type="radio"/> TH            | <input type="radio"/> TK | <input type="radio"/> JP |
| <input type="radio"/> Other |                                     |                          |                          |

### Countries

- |                                     |
|-------------------------------------|
| <input type="radio"/> CA            |
| <input checked="" type="radio"/> US |
| <input type="radio"/> US_HAW        |
| <input type="radio"/> Other         |

**Table 5-9** Country Code Description

Country Code	Country	Language
<b>CL-60E</b>		
GB	Great Britain	English
DE	Germany	English
FR	France	French
IT	Italy	English
ES	Spain	English
AT	Austria	English
AU	Australia	English
CZ	Czech	English
BE	Belgium	French
DK	Denmark	English
GR	Greece	English
NL	Netherlands	English
PT	Portugal	English
CN	China	English
SE	Sweden	English
RO	Romania	English
TH	Thailand	English
TK	Turkey	English
JP	Japan	Japanese
Other	Country not mentioned above	English
<b>CL-60A</b>		
CA	Canada	English
US	USA	English
US_HAW	USA - Hawaii	English
Other	Country not mentioned above	English

**NOTE:** When the country code selected is **TH**, **TK**, **DE**, **GR** or **Other**, the grid code specific to these country codes will appear on the LCD Display as shown below. Press  to choose grid code and press  to confirm.

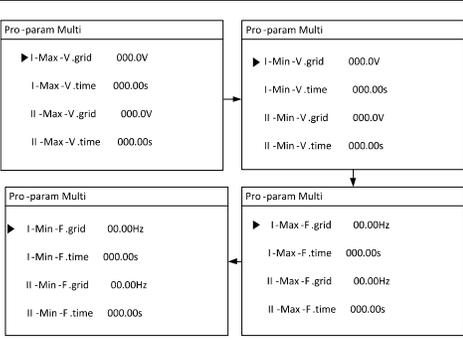
Grid Codes

<p><b>Grid codes</b></p> <p><input checked="" type="radio"/> GR_L <input type="radio"/> GR_IS</p> <p><b>NOTE:</b> When Country Code is <b>GR</b>.</p>	<p><b>Grid codes</b></p> <p><input checked="" type="radio"/> LV <input type="radio"/> MV</p> <p><b>NOTE:</b> When Country Code is <b>DE</b>.</p>
<p><b>Grid codes</b></p> <p><input checked="" type="radio"/> AG <input type="radio"/> YG</p> <p><b>NOTE:</b> When Country Code is <b>TK</b>.</p>	<p><b>Grid codes</b></p> <p><input checked="" type="radio"/> 220V <input type="radio"/> 230V</p> <p><b>NOTE:</b> When Country Code is <b>TH</b>.</p>
<p><b>Grid codes</b></p> <p><input checked="" type="radio"/> 50Hz <input type="radio"/> 60Hz</p> <p><b>NOTE:</b> When Country Code is <b>Other</b>.</p>	
<p>If the country code selected is not the five country codes above, there is no need to choose a grid code. The <b>Pro-Stage</b> screen will appear.</p> <p>Choose <b>Single-stage</b> or <b>Multi-stage</b>. Press  to choose a setting and press  to confirm.</p>	<p><b>Pro-Stage</b></p> <p><input checked="" type="radio"/> Single-stage <input type="radio"/> Multi-stage</p>

## Single-stage Protection Parameter Setting

<p>The following screen appears if <b>Single-stage</b> is selected.</p> <p>Press  to select a parameter,</p> <p>Press  to move the cursor and</p> <p>Press  to set.</p> <p>Press  to confirm.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>Pro-param Single</p> <hr/> <p>▶ Vgrid-max     276.0V</p> <p>Vgrid-min     184.0V</p> <p>Fgrid-max     51.50Hz</p> <p>Fgrid-min     49.80Hz</p> </div>
---	---

## Multi-stage Protection Parameter Setting

<p>The following screens appear if <b>Multi-stage</b> is selected.</p> <p>Press  to select a parameter,</p> <p>Press  to move the cursor and</p> <p>Press  to set.</p> <p>Press  to confirm.</p>	
---	---

**Table 5-10** Multi-stage Protection Parameters Explanation

Parameter	Explanation
<b>Max-V. prot</b>	Over-voltage protection
I-Max-V. grid	Stage I Grid over-voltage (U>)
I-Max-V. time	Stage I Grid over-voltage (U>) tripping time
II-Max-V. grid	Stage II Grid over-voltage (U>>)
II-Max-V. time	Stage II Grid over-voltage (U>>) tripping time
<b>Min-V. prot</b>	Under-voltage protection
I-Min-V. grid	Stage I Grid under-voltage (U<)
I-Min -V. time	Stage I Grid under-voltage (U<) tripping time
II-Min -V. grid	Stage II Grid under-voltage (U<<)
II-Min -V. time	Stage II Grid under-voltage (U<<) tripping time
<b>Max-F. prot</b>	Over-frequency protection
I-Max-F. grid	Stage I Grid over-frequency (f>)
I-Max-F. time	Stage I Grid over-frequency (f>) tripping time
II-Max-F. grid	Stage II Grid over-frequency (f>>)
II-Max-F. time	Stage II Grid over-frequency (f>>) tripping time
<b>Min-F. prot</b>	Under-frequency protection

**Table 5-10** Multi-stage Protection Parameters Explanation

Parameter	Explanation
I-Min-F. grid	Stage I Grid under-frequency (f<)
I-Min -F. time	Stage I Grid under-frequency (f<) tripping time
II-Min -F. grid	Stage II Grid under-frequency (f<<)
II-Min -F. time	Stage II Grid under-frequency (f<<) tripping time

## Protection Recovery Setting

<p>After setting the protection parameters, the inverter goes to the protection recovery screen.</p>	<table border="1" style="width: 100%;"> <thead> <tr> <th>Pro -recover</th> </tr> </thead> <tbody> <tr> <td>▶ Vmax-recover 240.0V</td> </tr> <tr> <td>Vmin-recover 220.0V</td> </tr> <tr> <td>Fmax-recover 50.10Hz</td> </tr> <tr> <td>Fmin-recover 49.50Hz</td> </tr> </tbody> </table>	Pro -recover	▶ Vmax-recover 240.0V	Vmin-recover 220.0V	Fmax-recover 50.10Hz	Fmin-recover 49.50Hz
Pro -recover						
▶ Vmax-recover 240.0V						
Vmin-recover 220.0V						
Fmax-recover 50.10Hz						
Fmin-recover 49.50Hz						

**Table 5-11** Description of Protection Recovery Parameters

Parameter	Description
Vmax-recover	Max. protection recovery voltage
Vmin-recover	Min. protection recovery voltage
Fmax-recover	Max. protection recovery frequency
Fmin-recover	Min. protection recovery frequency

## Protection Parameter Confirmation

<p>The setting confirmation interface will appear once the protection parameters are entered.</p> <p>Press  to confirm the parameter selection and press  to reset the protection parameters.</p>	<table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2">Setting confirmation</th> </tr> </thead> <tbody> <tr> <td>Countries</td> <td>Other</td> </tr> <tr> <td>Pro-stage</td> <td>Single -stage</td> </tr> <tr> <td>Grid codes</td> <td>MV</td> </tr> <tr> <td colspan="2" style="text-align: center;">Confirm above settings?</td> </tr> </tbody> </table> <p><b>NOTE:</b> The Setting Confirmation screen varies depending on the selected country. In this example, the country selected is Other.</p>	Setting confirmation		Countries	Other	Pro-stage	Single -stage	Grid codes	MV	Confirm above settings?	
Setting confirmation											
Countries	Other										
Pro-stage	Single -stage										
Grid codes	MV										
Confirm above settings?											

# Communication Parameter Setting

Main Screen (Press ) -> Menu (Press  three times) -> Set-param  
 (Press ) -> Enter Password (Press , Press  three times) -> Com-param (Press  )

<p>Press  to move the cursor and          Press  to set.          Press  to confirm.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>Com -param</p> <hr/> <p>▶ <b>Modbus param</b></p> <p>Uart param</p> <p>Ethernet param</p> </div>
<p>Device address range: 1-247.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>Modbus param</p> <hr/> <p>▶ Addr 001</p> </div>
<p>Baud rate can be set to 9600 bps or 19200 bps.          Parity can be set to NO, ODD or EVEN.          Stop bit can be set to 1 or 2.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>Uart param</p> <hr/> <p>▶ Baud [9600]</p> <p>Parity [ NO ]</p> <p>Stop bit [1]</p> </div>
	<div style="border: 1px solid black; padding: 5px;"> <p>Ethernet param</p> <hr/> <p>▶ DHCP [OFF]</p> <p>IP 192.168.001.100</p> <p>Sub net 255.255.255.000</p> <p>Gateway 192.168.001.001</p> </div>

# Advanced Setting Parameter Setting

Main Screen (Press  ) -> Menu (Press  three times) -> Set-param  
 (Press  ) -> Enter Password (Press , Press  four times) ->  
 Advanced Settings (Press  )

<p>Press  to move the cursor and                  Press  to set.</p>	<div style="border: 1px solid black; padding: 5px;"> <p><b>Advanced Settings</b></p> <hr/> <p><b>PVS Detect</b></p> <p>10min Max-V</p> <p>Grid Unbalance</p> <p>Switch Type</p> </div>
<p>PVS detect setting</p>	<div style="border: 1px solid black; padding: 5px;"> <p><b>PVS Detect</b></p> <hr/> <p><b>ON</b></p> <p>OFF</p> <p>Reset</p> <p>Set-param</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>PVS Detect</b></p> <hr/> <p>▶ <b>Low Current</b>                      <b>50.0%</b></p> </div>

<p>Arc Fault Detection - AFD (CL-60A only)</p>	<table border="1"> <tr> <td colspan="2"><b>AFD</b></td> </tr> <tr> <td colspan="2">AFD Self-test</td> </tr> <tr> <td>▶</td> <td><b>AFD ON</b></td> </tr> <tr> <td colspan="2">AFD OFF</td> </tr> </table>	<b>AFD</b>		AFD Self-test		▶	<b>AFD ON</b>	AFD OFF	
<b>AFD</b>									
AFD Self-test									
▶	<b>AFD ON</b>								
AFD OFF									
<p>10-minute Max-V setting</p>	<table border="1"> <tr> <td colspan="2"><b>10min Max-V</b></td> </tr> <tr> <td>▶</td> <td><b>10min Max-V [OFF]</b></td> </tr> <tr> <td></td> <td><b>Pro-value 253.0V</b></td> </tr> <tr> <td></td> <td><b>Rec-value 252.0V</b></td> </tr> </table>	<b>10min Max-V</b>		▶	<b>10min Max-V [OFF]</b>		<b>Pro-value 253.0V</b>		<b>Rec-value 252.0V</b>
<b>10min Max-V</b>									
▶	<b>10min Max-V [OFF]</b>								
	<b>Pro-value 253.0V</b>								
	<b>Rec-value 252.0V</b>								
<p>Grid unbalance setting</p>	<table border="1"> <tr> <td colspan="2"><b>Grid unbalance</b></td> </tr> <tr> <td>▶</td> <td><b>Grid Unbalance [OFF]</b></td> </tr> <tr> <td></td> <td><b>Amplitude 20%</b></td> </tr> <tr> <td></td> <td><b>Pro-time 05.00s</b></td> </tr> </table>	<b>Grid unbalance</b>		▶	<b>Grid Unbalance [OFF]</b>		<b>Amplitude 20%</b>		<b>Pro-time 05.00s</b>
<b>Grid unbalance</b>									
▶	<b>Grid Unbalance [OFF]</b>								
	<b>Amplitude 20%</b>								
	<b>Pro-time 05.00s</b>								
<p>Switch type setting</p>	<table border="1"> <tr> <td colspan="2"><b>Switch Type</b></td> </tr> <tr> <td>▶</td> <td><b>Switch Type [ 3 ]</b></td> </tr> </table>	<b>Switch Type</b>		▶	<b>Switch Type [ 3 ]</b>				
<b>Switch Type</b>									
▶	<b>Switch Type [ 3 ]</b>								

# 6

## Troubleshooting

Chapter 6 contains information about:

- Troubleshooting
- Maintenance

## Troubleshooting

 **DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.

**Failure to follow these instructions will result in death or serious injury.**

Access to live parts shall be limited to suitably qualified electrical personnel.

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**NOTE:** Some of the solutions presented in the troubleshooting section may require you to open the CL-60 enclosure temporarily while still receiving power from an AC source. Follow the **DANGER** safety message above prior to opening the CL-60 enclosure.

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## LED Indicator

Problem	Symptom	Check...	Solution
The CL-60 appears to be non-operational.	LED indicators and LCD screen are Off.	<p>... the downstream AC circuit breaker to see that it is closed (turned On).</p> <p>... the AC wiring connections on the AC circuit breaker and the inverter terminals.</p> <p>... the upstream DC circuit breaker to see that it is closed (turned On).</p> <p>... the DC switch on the inverter is turned to ON position.</p> <p>... the polarity of the PV arrays and that they match the cables leading to the inverter terminals.</p>	<p>Perform the “Lock-Out Tag-Out (LOTO) Procedure” on page xi.</p> <p>Revisit the instructions and perform “Cabling and Wiring” on page 3–3 and “Commissioning Procedure” on page 4–2 again.</p> <p>See NOTE on page 6–3.</p>
The CL-60 is energized but one or more of the LED indicators are showing symptoms.	<b>RUN</b>  LED indicator is Off	<p>... the AC wiring connections on the AC circuit breaker and the inverter terminals.</p> <p>... whether the DC input voltage exceeds the startup voltage of the inverter.</p>	<p>Perform the “Lock-Out Tag-Out (LOTO) Procedure” on page xi.</p> <p>Revisit the instructions and perform “AC Side Cable Connection” on page 3–7 and “PV Array Connection” on page 3–15 again.</p> <p>See NOTE on page 6–3.</p>
	<b>Alert</b>  LED indicator is On	... the LCD screen for a message.	<p>See “LCD Screen” on page 6–4 for a solution.</p> <p>If the problem persists, see NOTE on page 6–3.</p>
	<b>RUN</b>  LED indicator is flashing	... the LCD screen for a warning message.	<p>See “LCD Screen” on page 6–4 for a solution.</p> <p>See NOTE on page 6–3.</p>

**NOTE:** If the problem persists, contact technical support at:  
<http://solar.schneider-electric.com/tech-support>.

## LCD Screen

When a ground fault (or event) is detected, the LCD screen displays the message on the LCD screen. Press  to view multiple screens.

Event Code	Description	Solution
002	The grid voltage exceeds the inverter's allowable range. Protection time and protection thresholds depend on the country's requirements.	Measure the grid voltage. Follow the DANGER message at the beginning of this chapter.  If the grid voltage exceeds the inverter's allowable range, contact the utility company for suggestions.
003	Grid transient voltage exceeds the allowable range.	This is a short term event caused by the grid. Wait for the inverter to recover automatically. See NOTE on page 6–9.
004	The grid voltage is below the inverter's allowable lower limit. Protection time and protection thresholds depend on the country's requirements.	Measure the grid voltage. Follow the DANGER message at the beginning of this chapter.  If the grid voltage exceeds the inverter's allowable range, contact the utility company for suggestions.
005	The grid voltage is too low.	This is a short term event caused by the grid. Wait for the inverter to recover automatically. See NOTE on page 6–9.
006	The AC output current exceeds the inverter's protection limit.	Wait for the inverter to recover automatically when the AC output current falls below the protection limit. See NOTE on page 6–9.
007	Transient AC over current	Wait for the inverter to recover automatically.
008	The grid frequency exceeds the inverter's allowable upper limit.	Measure the grid frequency. Follow the DANGER message at the beginning of this chapter.  If the grid frequency exceeds the inverter's allowable range, contact the utility company for suggestions.
009	The grid frequency exceeds the inverter's allowable lower limit.	Measure the grid frequency. Follow the DANGER message at the beginning of this chapter.  If the grid frequency exceeds the inverter's allowable range, contact the utility company for suggestions.

Event Code	Description	Solution
010	Islanding	<p>Check whether the AC circuit breaker is connected.</p> <p>Check whether AC cables are all properly connected.</p> <p>Check whether the grid is in service.</p> <p>See NOTE on page 6–9.</p>
011	The DC component of the AC current exceeds the inverter's limit.	Wait for the inverter to recover automatically. See NOTE on page 6–9.
012	Current leakage is detected.	<p>Check for signs at the PV array site for a possible ground fault.</p> <p>See NOTE on page 6–9.</p>
013	A grid condition event is detected.	<p>If the grid voltage exceeds the inverter's allowable range, contact the utility company for suggestions.</p> <p>If the problem persists but the grid voltage is within the inverter's allowable range, contact technical support at: <a href="http://solar.schneider-electric.com/tech-support">http://solar.schneider-electric.com/tech-support</a></p>
014	The average grid voltage keeps exceeding the allowable range for over 10 minutes.	Wait for the inverter to recover automatically. See NOTE on page 6–9.
015	Grid impedance exceeds inverter's limit.	<p>Check that the AC cables used are specified correctly according to local electrical regulations.</p> <p>Wait for the inverter to recover automatically.</p> <p>See NOTE on page 6–9.</p>
016	AC output overload	Wait for the inverter to recover automatically. See NOTE on page 6–9.
017	Grid voltage imbalance	Wait for the inverter to recover automatically. Test the grid voltage to confirm the imbalance. See NOTE on page 6–9.

<b>Event Code</b>	<b>Description</b>	<b>Solution</b>
019	The transient bus voltage is high.	Wait for the inverter to recover automatically. See NOTE on page 6–9.
020	The bus voltage is high.	Wait for the inverter to recover automatically. See NOTE on page 6–9.
021	PV input over current	Check the PV configuration and connection.
023	PV configuration mode has changed during normal operation.	Check the PV configuration. Restart the inverter.
024	Neutral point deviation is detected.	Wait for the inverter to recover automatically when the deviation falls within the allowable range. Test the neutral for proper voltage and connection. See NOTE on page 6–9.
025	Transient unbalance of voltage neutral point	Wait for the inverter to recover automatically when the deviation falls within the allowable range. See NOTE on page 6–9.
026	Bus voltage is fluctuating.	Wait for the inverter to recover automatically. See NOTE on page 6–9.
036	Module temperature is too high.	Verify that the AC output power is not continually exceeding nominal power.  If it is, reduce the load and do not exceed nominal power requirements.
037	Ambient temperature is too high.	Check the functionality of the fans. Replace any broken fan if necessary.  Clean air outlet grills.  See NOTE on page 6–9.
038	An event is detected in the relay.	Wait for the inverter to recover automatically. See NOTE on page 6–9.

Event Code	Description	Solution
039	Inverter insulation resistance fault (ISO-flt)	Wait for the inverter to recover automatically. Test for insulation faults in the wiring. See NOTE on page 6–9.
040	IGBT saturation event	Wait for the inverter to recover automatically. See NOTE on page 6–9.
041	Current leakage sampling channel event	Wait for the inverter to recover automatically. See NOTE on page 6–9.
042	Current imbalance	Wait for the inverter to recover automatically. See NOTE on page 6–9.
043	The ambient temperature falls below -25 °C (-13 °F)	<p>Stop operating the inverter and disconnect it from all power sources.</p> <p>Wait for the ambient temperature to rise within the allowable range and then restart the inverter.</p>
044	DC/AC inversion circuit event	Wait for the inverter to recover automatically. See NOTE on page 6–9.
045	PV boost circuit event	Wait for the inverter to recover automatically. See NOTE on page 6–9.
047	PV configuration mode set on the display does not match the design.	<p>Disconnect the inverter from all power sources.</p> <p>See “PV Array Connection” on page 15 to reconnect the PV strings and reselect PV configuration mode.</p>
048	Phase-R current sampling channel event	Wait for the inverter to recover automatically. See NOTE on page 6–9.
049	Phase-S current sampling channel event	
050	Phase-T current sampling channel event	
051	Hardware Over-voltage/ Over-current protection	Wait for the inverter to recover automatically. See NOTE on page 6–9.

Event Code	Description	Solution
070	Fan event	<p>Stop operating the inverter, disconnect from all power sources.</p> <p>Remove and replace the broken fan.</p> <p>Contact technical support at: <a href="http://solar.schneider-electric.com/tech-support">http://solar.schneider-electric.com/tech-support</a>.</p>
071	AC side SPD event	Replace the SPD. For DC SPD, see “Replacing an Expended DC SPD” on page 6–14.
072	DC side SPD event	Remove and replace the expended SPD.
073	PV string fuse has blown	<p>Stop operating the inverter, disconnect from all power sources.</p> <p>Remove and replace the blown fuse. See “Replacing the Fuse” on page 6–13.</p>
074	LCD communication event	An event has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid. See NOTE on page 6–9.
075	Solar irradiation is not sufficient for inverter operation	<p>Wait for sufficient sunlight.</p> <p>If this event recurs when irradiation is sufficient, check the PV system design and adjust the connection of PV inputs.</p>
076	PV overload condition	Check the PV system design and adjust the connection of PV inputs.
078	PV power event warning	Check the PV input terminals for loose connections. Tighten the connections according to torque specifications found in “PV Array Connection” on page 3–15. See NOTE on page 6–9.
087	AFD block	Wait for the inverter to recover automatically. Test the PV string connectors for signs of damage. See NOTE on page 6–9.

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Event Code	Description	Solution
088	Arc fault warning	Check the current and press  to remove the warning.
089	AFD function warning	Restart the AFD function through the LCD display.
532–547	PV reverse polarity warning	Check the PV input terminals and cables for reverse polarity connections. Perform the instructions on “PV Array Connection” on page 3–15. See NOTE on page 6–9.
548–563	PV output current event	Check the PV array site for loose connections. Check that the PV cells are clean and not covered by debris. See NOTE on page 6–9.

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**NOTE:** If the problem persists, contact technical support at:  
<http://solar.schneider-electric.com/tech-support>.

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# Maintenance

## Routine Maintenance

Component	Maintenance	Frequency
CL-60 unit	<p>Check the temperature and dust accumulation on the inverter. Clear the inverter enclosure of any leaves, sand, and dust build up and other debris, if necessary.</p> <p>Check if the air inlet and outlet are clear of any debris. Clean the air inlet and outlet, if necessary.</p>	Every six months to a year (depending on air quality in the local area)
Fans	<p>Check whether there are visible cracks on the fan blades.</p> <p>Check for unusual noise when the fan is turning.</p> <p>Clean or replace the fans if necessary (see “Fan Maintenance” on page 6–11).</p>	Once a year
SPD	<p>Check the fuse and DC SPD.</p> <p>Replace the fuse (see “Replacing the Fuse” on page 6–13) and DC SPD whenever necessary.</p>	Every six months

## Maintenance Instructions

### Fan Maintenance

Fans inside the PV Inverter are used to cool the inverter during operation. If the fans do not operate normally, the inverter may not be cooled down and operational efficiency may decrease. Therefore, it is necessary to maintain the fans and keep them clean and free of debris. If necessary, replace broken fans. Contact your local Schneider Electric Sales Representative at: <http://solar.schneider-electric.com>.

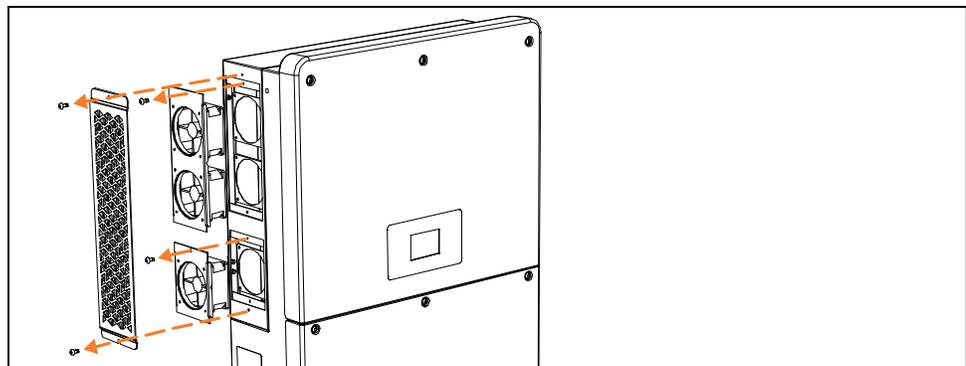
#### **⚡ ⚠ DANGER**

##### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never energize the inverter with the covers removed.
- Do not open fuse holders under load. The fuse must be de-energized from all sources before servicing.
- The inverter is energized from multiple sources. Before removing covers identify all source, de-energize, lock-out, and tag-out and wait 10 minutes. See “Lock-Out Tag-Out (LOTO) Procedure” on page xi.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.
- Replace all devices and covers before turning on power to this equipment.
- The DC conductors of this photovoltaic system are ungrounded and may be energized.

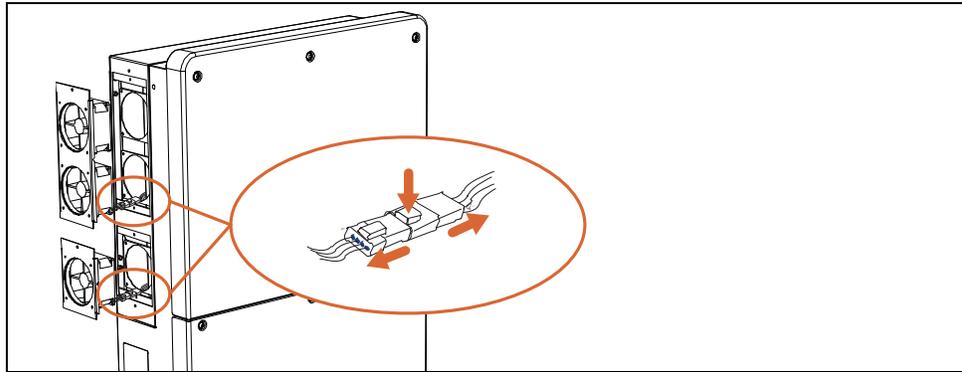
**Failure to follow these instructions will result in death or serious injury.**

1. Perform the steps in “Disconnecting the CL-60” on page 7–2.
2. Remove the screws holding the fan assembly to the enclosure as shown.

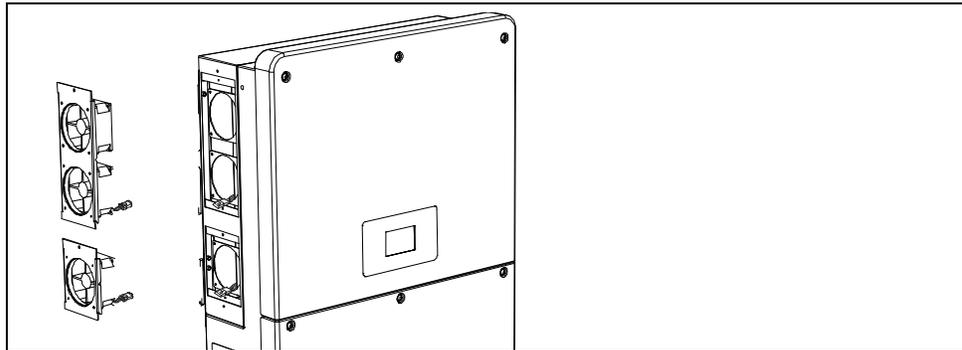


When the fan assembly is removed the fans' power wires will also get pulled out of the enclosure.

3. Press on the locking button on the fans' power connectors and pull the connectors outward from each other.



4. Remove the fans from the inverter.



5. Clean the fan with soft brush or vacuum cleaner (or replace the broken fans).

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**NOTE:** Do not use pressurized air (compressed air) to clean the fan. This will force debris inside the enclosure.

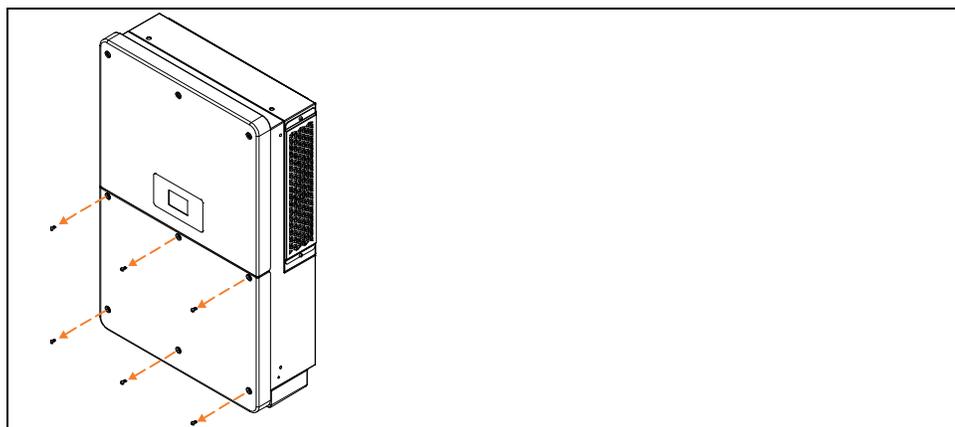
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6. Reassemble the fans (including plugging in the power connectors) back into the inverter.
7. Perform "Commissioning Procedure" on page 4-2.

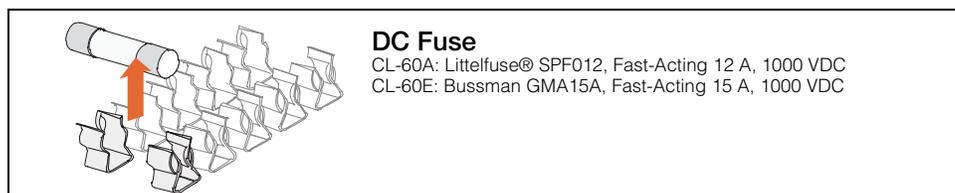
## Replacing the Fuse

### To replace the blown fuse due to an over current condition:

1. Open the AC circuit breaker (turn it OFF) and perform the “Lock-Out Tag-Out (LOTO) Procedure” on page xi, if not yet done.
2. Open the upstream DC disconnect (turn it OFF).
3. Turn the DC switch of the PV Inverter to OFF position.
4. Pull the DC cable from the MC4 (or H4) connector.  
Avoid using standard pliers. Use the proper MC4 (or H4) tool to disconnect the DC cable from the terminals.
5. Wait about ten minutes until the capacitors inside the inverter have discharged.
6. Remove the six screws on the front cover of the lower wiring box then put away the front cover. For torque, see “Torque Values” on page 2–15.



7. Measure the AC voltage to ground at the AC terminal to confirm that the AC output voltage of the inverter at the AC circuit breaker is zero.
8. Measure the DC voltage at the DC terminal to confirm that it is zero.
9. Identify the blown fuse from the fuse holder using a multimeter.
10. Remove the blown fuse using a suitable fuse holder remover.

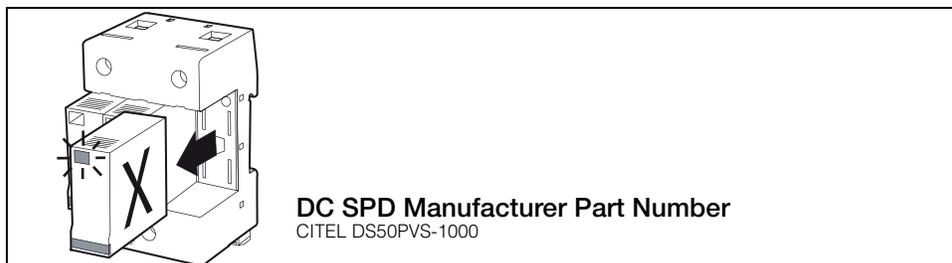


11. Insert the new fuse into the fuse holder. The replacement fuse has to be of the same type and rating. If not, procure the correct fuse.
12. Reassemble the inverter's front cover. For torque, see “Torque Values” on page 2–15.
13. Perform “Commissioning Procedure” on page 4–2.

## Replacing an Expended DC SPD

### To replace the DC SPD (surge protection device):

1. Open the AC circuit breaker (turn it OFF) and perform the “Lock-Out Tag-Out (LOTO) Procedure” on page xi, if not yet done.
2. Open the upstream DC disconnect (turn it OFF).
3. Turn the DC switch of the PV Inverter to OFF position.
4. Pull the DC cable from the MC4 (or H4) connector.  
Avoid using standard pliers. Use the proper MC4 (or H4) tool to disconnect the DC cable from the terminals.
5. Wait about ten minutes until the capacitors inside the inverter have discharged.
6. Remove the six screws on the front cover of the lower wiring box then put away the front cover. For torque, see “Torque Values” on page 2–15.
7. Measure the AC voltage to ground at the AC terminal to confirm that the AC output voltage of the inverter at the AC circuit breaker is zero.
8. Measure the DC voltage at the DC terminal to confirm that it is zero.
9. Identify the expended DC SPD cartridge by the red indicator (see picture below).
10. Remove the expended DC SPD cartridge by pulling the cartridge out of its housing using your index finger and thumb to grab the top and bottom edges.



11. Insert the new SPD into the housing in the same but opposite direction as step 10. The replacement SPD has to be of the same type and rating. If not, procure the correct SPD.
12. Reassemble the inverter’s front cover. For torque, see “Torque Values” on page 2–15.
13. Perform “Commissioning Procedure” on page 4–2.

## Cleaning the Air Inlet and Outlet

Heat is generated in the process of running the inverter. The inverter adopts a controlled forced-air cooling method.

In order to maintain good ventilation, make sure that the air inlet and outlet grates are not blocked and they are clear of any debris.

Clean the air inlet and outlet grates with a soft brush or a vacuum cleaner, if necessary.

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**NOTE:** Do not use pressurized air (compressed air) to clean the grates. This will force debris inside the enclosure.

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# 7

## Disconnecting, Dismantling, and Disposing the CL- 60

Chapter 7 contains information about:

- Disconnecting the CL-60
- Dismantling the CL-60
- Disposing the CL-60

## Disconnecting the CL-60

For maintenance work or any service work, the CL-60 PV Inverter must be disconnected from all power sources.

### **DANGER**

#### **ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH HAZARD**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel. Access to live parts shall be limited to suitably qualified electrical personnel. See installation instructions before connecting to the supply.
- Never operate energized with the CL-60 enclosure opened.
- Before opening the inverter's enclosure identify the power source, de-energize, lock-out, and tag-out and wait ten minutes for circuits to discharge. See "Lock-Out Tag-Out (LOTO) Procedure" on page xi.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.

**Failure to follow these instructions will result in death or serious injury.**

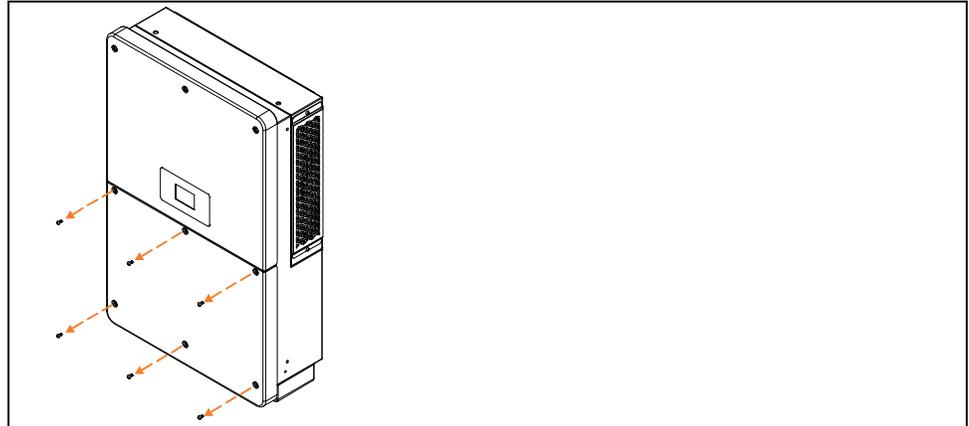
**To disconnect the inverter from DC and AC power sources:**

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**NOTE:** Follow steps 1 and 2 in sequence exactly.

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1. Open the AC circuit breaker (turn it OFF) and perform the "Lock-Out Tag-Out (LOTO) Procedure" on page xi, if not yet done.
2. Open the upstream DC disconnect device (turn it OFF).
3. Turn the DC switch of the PV Inverter to OFF position.
4. Pull all the DC cables from the MC4 (or H4) connectors.  
Avoid using standard pliers. Use the proper MC4 (or H4) tool to disconnect the DC cables from the terminals.
5. Wait about ten minutes until the capacitors inside the inverter have discharged.
6. Remove the six screws on the front cover of the lower wiring box then put away the front cover.



7. Measure the AC voltage to ground at the AC terminal to confirm that the AC output voltage of the inverter at the AC circuit breaker is zero.
8. Remove the AC cables from the terminals.
9. Remove the DC cables from the terminals.

## Dismantling the CL-60

### To dismantle the PV Inverter:

1. Reverse the steps found in “RS-485 Communication Connection” or “RJ45-RS-485 Communication Connection” on page 3–28 or “Ethernet Connection Procedure” on page 3–31.
2. Reverse the steps found in “AC Cable Connection” on page 3–10, “DC Cable Connection” on page 3–17, and “Cable Connection” on page 3–23.
3. Reverse the steps found in “Install and Mount the CL-60” starting on page 2–8.
4. Store the PV Inverter according to the guidelines below.
  - Inverter must be packed inside its original carton with the desiccant bags inside.
  - Store the inverter with its front panel facing up. The carton should lay flat and parallel to the ground.
  - Seal the carton with standard packaging tape.
  - Store the inverter in a dry and clean place to protect it against dust and moisture. See notice below.
  - Relative temperature: -30 to 85 °C (-22 to 185 °F)  
Relative humidity: 0 to 100%.
  - Do not stack more than two inverters (carton) together.
  - Keep the inverter away from chemically corrosive materials.
  - Periodically check for any visible damages to the carton and inspect the inverter right away if the carton shows signs of penetration during the storage period. Replace the carton, if necessary.

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**NOTE:** A thorough and professional inspection may be required before re-installing the inverter after more than six months in storage. Contact an authorized installer.

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## Disposing the CL-60

The end user of the CL-60 is responsible for the proper disposal of the PV Inverter.

As a general rule, do not dispose of or discard the CL-60 along with ordinary household garbage or organic waste.

Always follow regional, national, and /or local waste disposal directives concerning disposing, discarding, or recycling of equipment containing electronic and electrical components such as the CL-60.

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# 8

# Specifications

Chapter 8 contains information about:

- DC Side - Technical Specification
- AC Side - Technical Specification
- General Specifications
- User Interface and Communications
- Regulatory Approvals

## Product Specifications

<b>DC Side</b>	<b>Conext CL-60E (IEC) Conext CL-60JP (Japan)</b>	<b>Conext CL-60A (NA)</b>
DC Max. input voltage	1000 V	1000 V
Full power MPPT voltage range (PF=1) (VDC)	570 - 850 V	550 - 850 V
Operating voltage range at nominal AC voltage	570 - 950 V	550 - 950 V
Start voltage (VDC)	620 V	620 V
Max. array short circuit current (ADC)	140 A	140 A
Max. array input current (ADC)	120 A	120 A
Number of MPPT / Max. Number of inputs per MPPT	1 / 14	1 / 8 (Y connector adopted for up to 14 strings using 7 inputs)
DC connectors / Max. current per input (ADC)	MC4 / 12 A (mating part included)	Amphenol <sup>®</sup> H4 / 25 A (mating part included)
DC fuse	14 pairs (+/-), string monitoring included	8 pairs (+/-), string monitoring included
DC switch / DC SPD / AFD	Yes / Type II DIN rail surge arrester / None	Yes / Type II DIN rail surge arrester / Yes, AC Side
<b>AC Side</b>	<b>Conext CL-60E (IEC) Conext CL-60JP (Japan)</b>	<b>Conext CL-60A (NA)</b>
Max. AC output power (PF=1, nominal AC voltage)	60 kW	63.4 kW
Max. output fault current (AC) and duration	--	2150 Apk, 102 Arms, 155 ms
Max. Apparent power (nominal AC voltage)	66 kVA	63.4 kVA
AC nominal output voltage (VAC) / AC Voltage range A(VAC)	3/N/PE 400 V/230 V / 310 – 480 V	380 V / 295 - 456 V
Frequency / Frequency range	50 Hz & 60 Hz / 45 to 55 Hz & 55 to 65 Hz	60 Hz / 55 to 65 Hz

<b>AC Side</b>	<b>Conext CL-60E (IEC) Conext CL-60JP (Japan)</b>	<b>Conext CL-60A (NA)</b>
Max. Output current (AAC)	96 A	96 A
Power factor	0.8 lead to 0.8 lag adjustable	0.8 lead to 0.8 lag adjustable
THD at nominal power	< 3%	<3%
AC connection	Screw clamp terminal, AL - CU type cable compatible	Screw clamp terminal, AL - CU type cable compatible
AC disconnect	Not included	Included
AC connection	4 wire grounded WYE and ungrounded DELTA	4 wire grounded WYE and ungrounded DELTA

**NA Utility Interconnection Voltage and Frequency Trip Limits and Trip Times**

<b>Parameter</b>	<b>Default Trip Value</b>	<b>Conext CL-60A (NA) Default Trip Time (sec)</b>
Voltage Very High	457.2 VAC	0.16
Voltage High	420.8 VAC	1
Voltage Low	335.3 VAC	2
Voltage Very Low	190.5 VAC	0.16
Frequency Very High	60.5 Hz	0.16
Frequency High	60.5 Hz	0.16
Frequency Low	59.3 Hz	0.16
Frequency Very Low	57 Hz	0.16

**NOTE:** Accuracy for voltage and frequency is as follows:

- Voltage:  $\pm 4.0$  V (L-L)
- Frequency:  $\pm 0.1$  Hz
- Time: 1% but not less than 50 ms

<b>General Specifications</b>	<b>Conext CL-60E (IEC) Conext CL-60JP (Japan)</b>	<b>Conext CL-60A (NA)</b>
Peak efficiency	98.7%	98.7%
Euro efficiency	98.5%	n/a
CEC efficiency	n/a	98.0%
Power consumption at night time	< 1 W	< 1 W

## Specifications

<b>General Specifications</b>	<b>Conext CL-60E (IEC) Conext CL-60JP (Japan)</b>	<b>Conext CL-60A (NA)</b>
Enclosure rating	IP 65 (electronics), IP 20 (rear portion)	Type 4X (electronics), Type 3R (rear portion)
Protective class	I	--
OVC	III (mains), II (PV)	--
Inverter gross weight (including box)	76 kg	168 lbs
Inverter box dimensions (L x W x H)	1160 x 770 x 375 mm	45.7 x 30.3 x 14.8 in
Inverter net weight	66 kg	147 lbs
Inverter dimensions (L x W x H)	958 x 652 x 250 mm	38.9 x 25.7 x 9.8 in
Ambient air temperature for operation	-25 to 60°C, derating > 50°C	-13°F to 140°F, derating > 122°F
Max. Operating altitude	4000 m, derating > 3000 m	13123 ft, derating > 9842 ft
Relative temperature (in storage)	-30 to 85 °C	-22 to 185 °F
Relative humidity (%)	0 to 100% condensing	0 to 100% condensing
Audible noise	55 dBA ±3 dBA	55 dBA ±3 dBA
Inverter mounting	Wall mounting, vertical wall to 0° flat mounting	Wall mounting, vertical wall to 0° flat mounting
<b>User Interface and Communications</b>	<b>Conext CL-60E (IEC) Conext CL-60JP (Japan)</b>	<b>Conext CL-60A (NA)</b>
User interface	Graphic LCD display, 2 LEDs, 2 buttons and EasyConfig Tool	
Communication interface	RS485-Modbus, Modbus-TCP (Daisy chain capability for both: Modbus RS485 Serial or Modbus TCP over Ethernet). Communication protocol - SunSpec compatible & certied	

Regulatory Approvals	Conext CL-60E (IEC) Conext CL-60JP (Japan)	Conext CL-60A (NA)
Certifications	VDE0126-1-1, EN62109-1, EN62109-2, G59/3, BDEW, VDE-AR-N 4105, Emissions: IEC/EN 61000-6-3 Immunity: IEC/EN 61000-6-2, UTE C15-712-1, IEC 61683, IEC 61727, IEC 62116 AS 3100*, AS 4777.1* and AS4777.2*, CEI 021*	CSAus, UL 1741, IEEE 1547, IEEE1547.1, CSA C22.2#107.1-01-2001, FCC Part 15 Sub-part B, Class B Limits
Environmental	RoHS, REACH and 4K4H	RoHS

\*pending





## Schneider Electric

<http://solar.schneider-electric.com>

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this publication.

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